





# Manpower and Personnel Integration MANPRINT Handbook

OFFICE OF THE DEPUTY CHIEF OF STAFF
G1

**MANPRINT Directorate** 

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# **DISCLAIMER**

The views, opinions and comments contained in this document are those of the author and should not be construed as an official Agency position, or decision, unless so designated by other official documentation.

#### In Memory of

The MANPRINT Handbook is a memorial to General Maxwell R. Thurman, founder of the U.S. Army Manpower and Personnel Integration Program (MANPRINT). In 1982, General Maxwell R. Thurman, serving as the Army Deputy Chief of Staff for Personnel (DCSPER), tasked the U.S. Army Research Institute (ARI) to look at the development process of several recently fielded weapon systems. He further directed ARI to tell him what the Army could have done differently to better integrate Manpower, Personnel Capabilities, and Training (MPT) issues. This initiative, known as the Reverse Engineering Project, showed that the integration of MPT considerations early in the design process could have made a significant difference. At this point, General Thurman directed that a manpower and personnel integration program be initiated. The term "MANPRINT" was actually coined in 1984.



General Maxwell R. Thurman

18 February 1931 – 1 December 1995

#### **ACKNOWLEDGEMENTS**

This handbook for MANPRINT practitioners, action officers, managers, and leaders is a major revision of the "MANPRINT Guidebook" and the "MANPRINT In Acquisition: A Handbook."

#### **DEDICATION**

The MANPRINT Handbook is dedicated to the Army's most valuable asset: our "Soldiers"

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# **CHAPTER 1**

#### 1.0 INTRODUCTION TO MANPRINT

This handbook provides insight into the Army's Manpower and Personnel Integration (MANPRINT) Program, as well as, advice and recommendations. It has been prepared for Branch, Specified, Functional Proponent (FP), Materiel Developer (MATDEV), Program/Project/Product Manager (PM) and MANPRINT Action Officers (AO). These are the professionals who are responsible for coordinating, guiding, implementing and managing MANPRINT in the acquisition of Automated Information Systems (AIS) and/or materiel systems and for the leadership that has ultimate responsibility for MANPRINT. The term MANPRINT AO refers to a responsibility rather than an official duty title. This AO may come from any of the acquisition disciplines or domains.

This handbook is also designed to accommodate the reader by providing text underlined in blue that is linked to Chapters and Appendices in this document, as well as, very useful web sites. The U.S. Army Human Resources Command (HRC) uses a secure web site. If you are not on a secure Government operated computer network, you will have to copy the web address to your internet browser and select "Go" to gain access.

Department of Defense Instruction (DoDI) 5000.2 E7. Enclosure 7, paragraph E7.1, requires that a comprehensive management and technical strategy for Human Systems Integration (HSI) be initiated early in the acquisition process, specifically in the System Development and Demonstration (SDD) phase within the Defense Acquisition Management Framework. The entrance point for the SDD phase is at Milestone (MS) B approval and it is this milestone that marks the initiation of an acquisition program. The MANPRINT Program is the Army's implementation of the direction given by the Under Secretary of Defense for Acquisition, Technology, and Logistics (USD (AT&L)) for HSI and the Army's compliance with Title 10 of the United States Code. The program was established in 1984 with a primary objective to place the human element (functioning as individual, crew/team, unit and organization) on equal footing with other design criteria such as hardware and software. The entry point of MANPRINT in the acquisition process is through capability documents and studies. The Training and Doctrine Command (TRADOC) Pamphlet (Pam) 71-20 provides excellent guidance.

#### 1.1 What is MANPRINT?

#### 1.1.1 Overview

MANPRINT is a comprehensive management and technical program that focuses on the integration of human considerations (i.e., capabilities and limitations) into the system acquisition process: concept development, test and evaluation, documentation, design, development, fielding, post-fielding, operation and modernization of systems. It was initiated in recognition of the fact that the human is a key component of the total system. If the human cannot perform efficiently, the entire system will function sub-optimally.

The goal of MANPRINT is to enhance soldier-system design, reduce life-cycle ownership costs, and optimize total system performance. This is achieved by ensuring the "human" is fully and continuously considered as part of the total system (i.e., hardware and software) in the development and /or requisition of all systems. Human performance is a key factor in "total system performance" and enhancements to human performance will correlate directly to enhanced total system performance and reduce life cycle costs. To facilitate this, MANPRINT is divided into seven domains. Each MANPRINT domain is described in greater detail in the following paragraphs. The Deputy Chief of Staff (DCS), G-1, via the MANPRINT Directorate (DAPE-MR), exercises Department of the Army (DA) staff responsibility for the MANPRINT program. This is in keeping with the Army DCS, G-1 DA staff responsibilities for the formulation, management, evaluation, and execution of manpower and personnel policies, plans and programs for all components of the Army.

# 1.1.2 Manpower

Manpower addresses the number of military and civilian personnel required and potentially available to operate, maintain, sustain, and provide training for systems in accordance with Section 2434 of Title 10, U. S. Code. It is the number of personnel spaces (required or authorized positions) and available people (operating strength). It considers these requirements for peacetime, conflict, and low intensity operations. Current and projected constraints on the total size of the Army/organization/unit are also considered. The MANPRINT practitioner evaluates the manpower required and/or available to support a new system and subsequently considers these constraints to ensure that the human resource demands of the system do not exceed the projected supply. An example of a manpower constraint is: there cannot be any increase to the manpower end-strength of the Army to support the acquisition of a new system. If a system requires additional manpower, a billpayer (usually another Military Occupational Specialty (MOS)) must be identified. Combat Support (CS) and Combat Service Support (CSS) requirements are typically workload driven and determined by the system itself, the mission, the Operational Mode Summary/Mission Profile (OMS/MP), or Manpower Requirements Criteria (MARC). Operator/combat requirements are more frequently determined by doctrine.

#### 1.1.3 Personnel Capabilities

Manpower and personnel are closely related. While manpower looks at numbers of spaces and people, the domain of personnel addresses the cognitive and physical characteristics and capabilities required to be able to train for, operate, maintain, and sustain materiel and information systems. Personnel capabilities are normally reflected as Knowledge, Skills, Abilities, and Other characteristics (KSAOs). The availability of personnel and their KSAOs should be identified early in the acquisition process and may result in specific thresholds. On most systems, emphasis is placed on enlisted personnel as the primary operators, maintainers, and supporters of the system. Personnel characteristics of enlisted personnel are easier to quantify since the Armed Services Vocational Aptitude Battery (ASVAB) is administered to potential enlistees. The Armed Forces Qualification Test (AFQT) determines if the individual is eligible for enlistment and the Aptitude Area scores will determine the Career Management Fields (CMFs) and MOSs the individual is qualified to enter (upon completion of basic training). Qualification requirements for Commissioned, Warrant Officers, and Enlisted are contained in

DA Pam 611-21 and the HRC Smartbook. Typically, enlisted personnel are operators and maintainers. That is not always the case, especially in aviation systems. In many cases, the technical and command & control demands placed on officers and warrant officers is a major concern in system acquisition. It must also be remembered that with information systems, the primary operators and maintainers may be civilians as is depot level maintenance and supply of materiel systems. The civilian General Schedule (GS) series qualification requirements are contained in the X-118 and local crediting plans address wage grade qualifications. This must be considered and evaluated in the acquisition of a system. Early in the requirements determination process, identification of the target audience should be accomplished and used as a baseline for assessment as well as a guide in system design. Cognitive and physical demands of the system should be assessed and compared to the projected supply. MANPRINT also takes into consideration personnel factors such as availability, recruitment, skill identifiers, promotion, and assignment.

# 1.1.4 Training

Training is defined as the instruction, education, on-the-job, or self development training required providing all personnel and units with essential job skills, and knowledge. Training is required to bridge the gap between the target audience's existing level of knowledge and that required to effectively operate, deploy/employ, maintain and support the system. The MANPRINT goal is to acquire systems that meet the Army's training thresholds for operation and maintenance. Key considerations include developing an affordable, effective and efficient training strategy (which addresses new equipment, training devices, institutional, sustainment, and unit collective tactical training); determining the resources required to implement it in support of fielding and the most efficient method for dissemination (contractor, distance learning, exportable packages, etc.); and evaluating the effectiveness of the training.

Training is particularly crucial in the acquisition and employment of a new system. New tasks may be introduced into a duty position; current processes may be significantly changed; existing job responsibilities may be redefined, shifted, or eliminated; and/or entirely new positions may be required. It is vital to consider the total training impact of the system on both the individuals and the organization as a whole. Clearly, the cost and considerations of system ownership include initial and sustainment training, that is both unit and institutional. Embedded training is the preferred method of training. <a href="DoDI 5000.2">DoDI 5000.2</a>, Enclosure 7, paragraph E7.6 is quoted in part as stating, "The PM shall develop training system plans to maximize the use of new learning techniques, simulation technology, embedded training, and instrumentation systems that provide anytime, any place training and reduce the demand on the training establishment." In addition, training must consider the unique needs of commissioned officers, warrant officers, enlisted, and civilian personnel. The System Training Plan (STRAP) is developed simultaneously with the Capability Development Document (CDD).

# 1.1.5 Human Factors Engineering (HFE)

The goal of HFE is to maximize the ability of an individual or crew to operate and maintain a system at required levels by eliminating design-induced difficulty and error. Human Factors engineers work with systems engineers to design and evaluate human-system interfaces to ensure

they are compatible with the capabilities and limitations of the potential user population. HFE is conducted during all phases of system development, to include requirements specification, design and testing and evaluation. HFE also includes the requirements of the HSI Domain of Habitability. The PM is required to establish habitability requirements for the physical environment (e.g., adequate space and temperature control) and, if appropriate, requirements for personnel services and living conditions that have a direct impact on meeting/sustaining system performance or that have such an adverse impact on quality of life and morale that recruitment/retention is degraded. HFE activities during requirements specification include: evaluating predecessor systems and operator tasks; analyzing user needs; analyzing and allocating functions; and analyzing tasks and associated workload. During the SDD phase, HFE activities include: evaluating alternative designs through the use of equipment mock-ups and software prototypes; evaluating software by performing usability testing; refining analysis of tasks and workload; and using modeling tools such as human figure models to evaluate crew station and workplace design and operator procedures. During the testing and evaluation phase, HFE activities include: confirming that the design meets HFE specification requirements; measuring operator task performance; and identifying any undesirable design or procedural features.

# 1.1.6 System Safety (SS)

System Safety is the design features and operating characteristics of a system that serve to minimize the potential for human or machine errors/failures that cause injurious accidents. Safety considerations should be applied in system acquisition to minimize the potential for accidental injury of personnel and mission failure. For example, one primary concern may be electrical safety. The SS engineer should determine the requirements for grounding the system, procedures that must be followed to safely power-up or power-down the system, and the potential system malfunctions that could cause an electrical fire.

# 1.1.7 Health Hazards (HH)

Health Hazards addresses the design features and operating characteristics of a system that create significant risks of bodily injury or death. Along with safety hazards, an assessment of health hazards is necessary to determine risk reduction or mitigation.

The goal of the Health Hazard Assessment (HHA) is to incorporate biomedical knowledge and principles early in the design of a system to eliminate or control health hazards. Early application will eliminate costly system retrofits and training restrictions resulting in enhanced soldier-system performance, readiness and cost savings. HHA is closely related to occupational health and preventive medicine but gets its distinctive character from its emphasis on soldier-system interactions of military unique systems and operations.

Health Hazard categories include acoustic energy, biological substances, chemical substances, oxygen deficiency, radiation energy, shock, temperature extremes and humidity, trauma, vibration, and other hazards. Health hazards include those areas that could cause death, injury, illness, disability, or a reduction in job performance. For example, system evaluation should ensure that there is neither excessive noise nor opportunity for exposure to dangerous emissions.

# 1.1.8 Soldier Survivability (SSv)

Soldier survivability addresses the characteristics of a system that can reduce fratricide, detectability, and probability of being attacked, as well as minimize system damage, soldier injury, and cognitive and physical fatigue. It was added to focus attention on those aspects of the total system that can minimize the loss of friendly troops' lives.

For example, ensuring the system does not have an identifiable electronic or thermal signature or create an unacceptable fratricide risk may enhance survivability. The SSv evaluation would also ensure that there is adequate ballistic protection for crew survivability (e.g., application of antispalling material in crew compartments).

# 1.1.9 Domain Integration

Although each of the MANPRINT domains has been introduced separately, in practice they are often interrelated and tend to impact on one another. Changes in system design to correct a deficiency in one MANPRINT domain nearly always impact another domain. Consider the following examples:

- Working with the systems engineer, the human factors engineer determines that a number of particularly difficult tasks, currently performed manually, should be automated (analysis of function allocation to man, machine, or a combination). The result may be one or several of the following: 1) a reduction in operator manpower requirements; 2) personnel would no longer need extensive training on these tasks; 3) it is possible that someone with less experience or fewer qualifications could perform the job; or 4) an increase in personnel capabilities and training for new maintenance tasks. (Domains: human factors engineering, manpower, personnel, and training)
- A system is being designed for operation by two people in two shifts. It must operate 24 hours/day. An HFE workload assessment determines that the 12-hour shift produces intense fatigue. At the same time, a human factors engineering assessment determines that changing the background color of the screen from lime green to pacific blue will help to reduce, but not eliminate, the fatigue. The decision is made to change the background color, and a decision will have to be made between increasing manning or accepting the potential degradation of mission performance. (Domains: manpower and human factors engineering)
- A number of conceptual designs are being considered. The least costly requires maintenance by personnel in a job classification that is currently under-strength and is projected to remain so for the next six years. Another design, which will cost more, contains self-diagnostics. This system will not require the skills of the highly demanded personnel. The decision is made to acquire the second system because qualified personnel simply will not be available to maintain the first system. Because of the built-in test capability, additional training will not be required for maintenance personnel. (Domains: manpower, personnel, and training)

# 1.2 What is Your Role in MANPRINT?

#### 1.2.1 System Lead

The System FP/Combat Developer (CBTDEV) assumes the lead for system development until a PM is appointed. They appoint a MANPRINT AO to ensure that MANPRINT risks, constraints, and opportunities for enhancing total system performance are identified and given adequate consideration and analysis. As well as ensure that MANPRINT files are established, initiate the Target Audience Description (TAD)/Target Occupational Specialty (TOS) development; establish the MANPRINT Working Level Integrated Product Team (WIPT), or Integrated Product Team (IPT) and other duties as may be required to support system development. Appendices K through O contain MANPRINT Domain Checklist that can assist you in determining some of the risks that could impact your system.

# 1.2.2 The MANPRINT Action Officer (AO)

As the MANPRINT AO for the PM on an Integrated Product Team or on an Integrated Concept Team supporting a FP, CBTDEV, or Training Developer (TNGDEV), your role is critical to ensure that the end item produced is effective and safe for the soldier, civilian, or contractor (i.e., our primary customer). You have been entrusted with ensuring that MANPRINT issues/risks, constraints, and opportunities for enhancing total system performance are identified and given adequate consideration and analysis. To do so, you must be skilled in MANPRINT and marketing.

A truly effective MANPRINT program requires both management and technical skills. On the management side, the AOs must keep track of the schedule/status of the entire acquisition program to ensure that required MANPRINT actions are being accomplished. The AOs must assist the CBTDEV, TNGDEV, FP (as the originator of requirements and system support documents) in identifying and substantively attending to MANPRINT constraints, requirements, and Test and Evaluation (T&E) issues and criteria. The AOs should inform the CBTDEV, TNGDEV, FP, and/or PM when MANPRINT coordination meetings should be held and must keep members of the MANPRINT Team (discussed in Chapter 3) informed as the acquisition proceeds.

On the technical side, MANPRINT AOs are responsible for recommending how to address/resolve issues/risks as they arise. This will include recommending/performing analyses and studies and reviewing the program management and technical documentation produced by other disciplines (e.g., system engineering, integrated logistics support) involved in the acquisition process. You are also responsible for ensuring that MANPRINT is crosswalked with other ongoing efforts and is reflected accurately and consistently in the documents that are produced as a result of these efforts (see Section 4 for a discussion of crosswalking).

As professionals with day-to-day responsibilities for MANPRINT, one of the most critical things that AOs must do is COMMUNICATE AND FOLLOW UP! This is the only way to keep informed and be able to influence vital decisions. Attendance at formal meetings and

participation on ICTs, IPTs, and other working groups is necessary, but not sufficient. Many decisions are made and are irrevocable by the time meetings are held.

Finally, it is critical that MANPRINT has high visibility and leadership acceptance. It is your job to make this happen. You must keep the Program Manager (the PM is normally appointed at Program Initiation at MS B approval) and FP, TNGDEV or CBTDEV informed about the status and contributions of the MANPRINT effort, and your interaction and communication with other stakeholders will help to gain their acceptance.

#### 1.3 What Governs MANPRINT?

MANPRINT is the Army's execution of Department of Defense's (DoD's) HSI. The Department of Defense Directive (DoDD) 5000.1, Enclosure 1, paragraph E1.29, states, "The PM shall apply human systems integration to optimize total system performance (hardware, software, and human), operational effectiveness, and suitability, survivability, safety, and affordability." DoDI 5000.2, Paragraph 3.4.1, states, "The capability needs and acquisition management systems shall use Joint Concepts, integrated architectures, and an analysis of Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities (DOTMLPF) in an integrated, collaborative process to define desired capabilities to guide the development of affordable systems." Also, E7. Enclosure 7, Human Systems Integration (HSI), Paragraph E7.1, states, "The PM shall have a comprehensive plan for HSI in place early in the acquisition process to optimize total system performance, minimize total ownership costs, and ensure the system is built to accommodate the characteristics of the user population that will operate, maintain, and support the system."

The MANPRINT Program is governed by Army Regulation (AR) 602-2, Manpower and Personnel Integration (MANPRINT) in the System Acquisition Process. AR 602-2 prescribes policies and assigns responsibilities for the program. The MANPRINT Web Page at <a href="https://www.manprint.army.mil">www.manprint.army.mil</a> is a valuable source of information and guidance on MANPRINT.

# 1.4 MANPRINT Training

The proponent for MANPRINT training is the MANPRINT Directorate, Office of the Deputy Chief of Staff G-1. Instruction is provided by the Army Logistics Management College (ALMC), Ft Lee, VA. MANPRINT Course information, class schedules and registration may be obtained at the ALMC Acquisition Management Department web site at <a href="http://www.almc.army.mil/AMD">http://www.almc.army.mil/AMD</a>

Additional information on MANPRINT training is also available on the MANPRINT Web Page at http://www.manprint.army.mil./manprint/redir.asp?Page=mp-home-main.asp

The "MANPRINT Newsletter" is a bulletin published by the MANPRINT Directorate and it is available on the MANPRINT Web Page at

http://www.manprint.army.mil./manprint/redir.asp?Page=mp-home-main.asp. Those who do not have access to the Internet, the Newsletter is available by mail and is free of charge. It contains a great deal of useful, interesting information, including training schedules, and is a forum for

communication among professionals in the MANPRINT community. Information on how to receive the "MANPRINT Newsletter" is shown below.

To receive the "MANPRINT Newsletter," send the following information:

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20310-0300 Fax: (703) 695-6997 E-mail: MANPRINT@hqda.army.mil

#### 1.5 MANPRINT Tools

Since the inception of the MANPRINT program in 1984, MANPRINT-related tools have been developed by a number of agencies. They range from paper-based to PC- and main frame-based tools. They provide general guidance for conducting MANPRINT and related activities.

Visit each of the MANPRINT Domain Agencies for available tools and guides at <a href="http://www.manprint.army.mil./manprint/redir.asp?Page=mp-home-main.asp">http://www.manprint.army.mil./manprint/redir.asp?Page=mp-home-main.asp</a>

Other tools offer specific domain analytical support, such as estimating manpower, personnel, and training resource requirements; identifying and rating soldier survivability issues; and performing workload, cost, and task analyses. Tools and guides are found in Appendix F.

#### **CHAPTER 2**

# 2.0 THE ACQUISITION PROGRAM

This chapter briefly discusses the acquisition strategy, selected acquisition approaches, and system acquisition phases. It is concluded by a discussion of Integrated Capabilities Development Team (ICDTs) and Integrated Product Team (IPTs).

# 2.1 Acquisition Strategy

Each PM develops and documents an acquisition strategy that serves as the roadmap for program execution from program initiation through post-production support and retirement. A primary goal is to minimize the time and cost of satisfying an identified, validated need, consistent with common sense and sound business practices. It evolves through an iterative process and becomes increasingly more definitive in describing the essential elements of a program. It is tailored to meet the needs of the individual program, to include management requirements imposed on the contractor.

DoDI 5000.2, paragraph E7.1, directs the PM have a comprehensive plan for HSIS in place early in the acquisition process and that the HSI planning be summarized in the acquisition strategy. See above reference for additional details.

The development of the acquisition strategy provides opportunities for the MANPRINT AO to embed MANPRINT and assist the Program Manager (PM). Some key actions/considerations might include:

- Participating in WIPT meetings associated with planning and developing the acquisition strategy.
- Ensuring that sufficient time has been allocated to MANPRINT analyses and planned operational test and evaluation events.
- Reviewing the logistics concept to ensure that it is synchronized with the TAD and training concepts.
- Reviewing the PM and contractor management concept to ensure that MANPRINT is considered.
- Ensuring that MANPRINT efforts take the acquisition strategy (schedules, events, management structure) into account. For example, if an incremental or spiral acquisition strategy is planned, then the system will be fielded in capability "blocks." As successive blocks are designed and fielded, MANPRINT issues may either arise or be resolved. What may have been a problem in one version of the system may not be an issue when the next block is fielded. On the other hand, what was not a problem when the 1<sup>st</sup> block was fielded may become a problem. (For example, will an upgrade affect the maintenance concept and hence the target audience?)

# 2.2 Acquisition Approaches (Many systems will have components that are reflective of a combination of the following acquisition approaches)

# 2.2.1 Product Improvement

- Priority consideration shall always be given to the most cost effective solution over the system's life-cycle. Generally, use of or modification to a system or equipment that the Government already owns is more cost effective than acquiring new materiel. There are two types of product improvement: Pre-Planned Product Improvement (P3I) and modification.
- Modification is simply a change made to a weapon or information system that is in production so that it will better suit the intended purpose and/or target audience.
- P3I is used when market research or testing indicates current technology will not meet the requirements of the user but fielding a cost effective near term solution with current technology while planning to add or upgrade capabilities as technology matures.

# 2.2.2 Non-Developmental Items (NDI)/ Commercial-Off- The-Shelf (COTS)

The PM is strongly encouraged, wherever possible, to use NDI/COTS products as the primary source of supply. Whenever possible, recommend a MANPRINT representative participate as a member of the market research team. Acquisition of NDI/COTS may be particularly attractive because the time and cost required to get the system to the user can be significantly reduced. Department of Defense (DoD) provides the following definitions pertaining to NDI/COTS:

- NDI: (1) any previously developed item of supply used exclusively for Governmental purposes by a Federal Agency, a State or local Government, or a foreign government with which the United States has a mutual defense cooperation agreement; (2) any item described in (1) that requires only minor modification or modifications of the type customarily available in the commercial marketplace in order to meet the requirements of the procuring department or agency; or (3) any item described in (1) or (2) solely because the item is not yet in use.
- COTS: any item, other than real property, that is of a type customarily used for nongovernmental purposes and that: (1) has been sold, leased, or licensed to the general public; or, (2) has been offered for sale, lease, or license to the general public; or any item that evolved through advances in technology or performance that is not yet available in the commercial marketplace, but will be available in the commercial marketplace in time to satisfy the delivery requirements under a Government solicitation.
- Modified Commercial Item: any item with modifications of a type customarily available in the commercial marketplace or minor modifications of a type not customarily available in the commercial marketplace made to meet Federal Government requirements.

Acquisitions involving NDI/COTS pose unique challenges to the MANPRINT practitioner, because the ability to influence actual system design can be minimal. This is not to say, however, that MANPRINT does not play a role. In fact, MANPRINT issues, risks, and concerns should be

a major determinant of whether an NDI/COTS solution is viable. Suitability to the aptitudes, knowledge and skills of the intended target audience; trainability (anticipated training costs) of the system; the human-machine interface; and the ability of the NDI/COTS components to satisfy total system performance requirements are among the many MANPRINT considerations that should be addressed completely and early in the decision process, during market surveillance and market research.

Market surveillance activities are conducted on a continual basis by the Army Materiel Command (AMC) and Army Research, Development, and Engineering Centers (RD&ECs). The purpose is to keep abreast of developing trends and new technologies in the commercial marketplace with potential for military application. When the user defines the need as expressed in the Initial Capabilities Document (ICD), the AMC commodity-oriented Major Subordinate Command (MSC) will make a determination regarding whether NDI/COTS is feasible. If so, the MSC will begin market research.

Market research is used to identify what is currently available in the commercial marketplace or in use by other agencies. Market research will also identify current and emerging technologies and their potential application to the specific Army need. If the market research indicates that a commercial solution is available, requirements documents must be written so they do not preclude the adoption of the commercial solution. If the research indicates that there is not a commercial item available, the materiel or information system requirements must be supportable with the current technologies identified in the market research. The decision may also be made to assume the risk associated with writing requirements that depend on emerging technologies identified in the market research. This constitutes a P3I program (discussed in Paragraph 2.2.1).

MANPRINT considerations should be incorporated into market research. Issues/risks, and concerns identified by the ICDT for inclusion in the ICD and the System MANPRINT Management Plan (SMMP) (discussed in Chapter 4) will form the basis for MANPRINT evaluation of NDI/COTS hardware and/or software. This information should be crosswalked into independent evaluation plans and other pertinent requirements documents (e.g., the CDD). A primary avenue of MANPRINT influence in NDI/COTS acquisitions is to make MANPRINT (or preeminent domains thereof) a major criterion in the Request for Proposal (RFP) and source selection process.

The MANPRINT action officer should carefully evaluate any information provided by industry for MANPRINT implications. Most importantly, the MANPRINT AO should work closely with the PM to ensure that all relevant concerns and issues/risks are fully understood as important decisions are made about the system.

#### 2.2.3 Developmental

# 2.2.3.1 Evolutionary Design

Evolutionary acquisition is the preferred DoD strategy for rapid acquisition of mature technology for the user. An evolutionary approach delivers capability in increments, recognizing, up front, the need for future capability improvements. The objective is to balance needs and available capability with resources, and to put capability into the hands of the user quickly. Department of Defense Instruction (DoDI 5000.2, paragraph 3.3.1)

# 2.2.3.2 Spiral Development

In this process, a desired capability is identified, but the end-state requirements are not known at program initiation. Those requirements are refined through demonstration and risk management; there is continuous user feedback; and each increment provides the user the best possible capability. The requirements for future increments depend on feedback from users and technology maturation. (DoDI 5000.2, paragraph 3.3.2.1)

# 2.2.3.3 Incremental Development

In this process, a desired capability is identified, an end-state requirement is known, and that requirement is met over time by developing several increments, each dependent on available mature technology. (DoDI 5000.2, paragraph 3.3.2.2)

# 2.2.4 Other Acquisition Strategies

# 2.2.4.1 Joint Programs

Any acquisition system, subsystem, component, or technology program that involves a strategy that includes funding by more than one DoD Component during any phase of a system's life cycle is considered a joint program.

The new <u>DoDI 5000.2</u>, paragraph 3.4.1 states that, "analysis of Doctrine, Organization, Training, Materiel, Leadership, Personnel and Facilities (DOTMLPF) in an integrated, collaborative process to define desired capabilities to guide the development of affordable systems." TRADOC integrates *Military Environmental Protection* across the Doctrine, Organization, Training, Materiel, Leadership, Personnel and Facilities (DOTMLPF) products or JCIDS/CIDS, <u>TRADOC Pam 71-20</u>. The MANPRINT Action Officer may see analysis of DOTMLPF for Joint Service systems or DTLOMS used in development of Army systems.

The designated lead DoD Component Head will select a single qualified PM for the designated joint program. It will have one quality assurance program, one program change control program, one integrated test program and one set of documentation and reports to include one Joint ICD, CDD, or CPD; one TEMP, one Acquisition Program Baseline (APB), etc. HSI is the correct term for MANPRINT in joint programs.

# 2.2.4.2 System of Systems (SoS)

The Army is moving away from the stove pipe model of developing and acquiring systems in favor of a system-of-systems approach to capabilities determination, development, acquisition, and fielding. The system-of-systems approach recognizes that every platform, weapon system, computer, radio, piece of equipment, and even every soldier is not only a unique entity, but also is a part of a greater system. The system-of-systems approach emphasizes seamless integration, cooperative development, and commonality of components wherever possible. Digitization represents the clearest example of the system-of-systems approach, where common technologies and requirements are leveraged across different systems to speed development, reduce costs, and enhance capabilities. The MANPRINT practitioner must ensure that MANPRINT activities not only address the soldier interface within the individual system, but the soldier's issues and concerns within the system-of-systems.

The system of systems concept allows the massing of effects, not forces. The synergistic effect is a force capable of dominating the battle space and setting the conditions to ensure that dominance is maintained. The system-of-systems approach will be applied toward all future fieldings, with the Brigade Combat Teams (BCTs) serving as the cornerstone. However, the Army has, in reality, been fielding SoS for years. Family of Systems (FoS) use common parts and operate in similar ways. It is a rare system that is independent of any other system. The Capstone Requirements Document (CRD) is the requirements management document that sets common standards and requirements. The CRD cannot be used to justify procurement. Each individual system requires its own CDD and CPD.

# 2.2.4.3 Warfighting Rapid Acquisition Programs (WRAP)

WRAP implements the Army's accelerated procurement of systems. These systems have been identified through TRADOC warfighting experiments as compelling needs. It is implemented within existing Army structures and organizations. This process links TRADOC experimentation with systems acquisition.

# 2.2.4.3.1 Advanced Warfighting Experiments (AWEs)

AWEs are the culminating efforts in evaluating major increases to warfighting capability. They cross the TRADOC domains of DOTMLPF. They synergistically combine new force structure, doctrine, and materiel to counter a tactically competent opposing force. Moreover, they impact most, if not all, of the battlefield dynamics and battlefield operating systems. AWE Managers must ensure that their technology demonstrations include appropriate consideration of MANPRINT, tailored to the scope and nature of their program.

# 2.2.4.3.2 Concept Experimentation Programs (CEPs)

CEPs have not been included in TRADOC Reg 71-20 or TRADOC Pam 71-20.

#### 2.2.4.3.3 Advanced Technology Demonstrations (ATDs)

ATDs are a category of technology demonstrations. They are risk-reducing, integrated, "proof of principle" demonstrations designed to assist near-term system developments in satisfying specific operational capability needs. They accelerate introduction of new technologies into the operational systems. ATD Managers, like AWE Managers, must ensure that their technology demonstrations include appropriate consideration of MANPRINT, tailored to the scope and nature of their program.

# 2.2.4.3.4 Advanced Concept Technology Demonstrations (ACTDs)

ACTDs accelerate the application of mature technologies configured in a way that is useful in response to a critical military operational need. ACTDs provide an evaluation of the military utility of proposed solutions and are jointly planned by users and technology developers to enable operational forces to experiment in the field with new technologies. The experiments are designed to evaluate potential changes to doctrine, warfighting concepts, tactics, modernization plans, and training. ACTD Managers must also ensure that their technology demonstrations include appropriate consideration of MANPRINT, tailored to the scope and nature of their program.

# 2.3 Systems Acquisition Phases

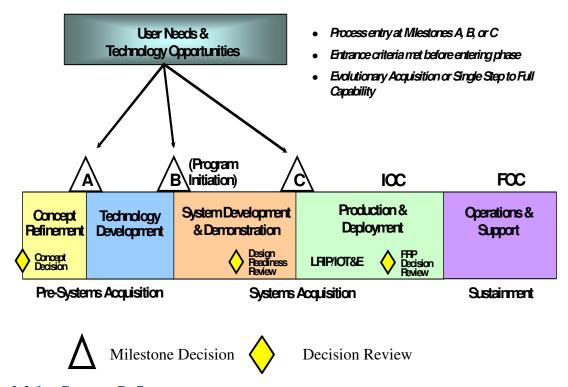
The acquisition of a system is broken down into five phases and three Milestone Decision Reviews (A, B, and C). The phases are:

- Concept Refinement
- Technology Development
- System Development & Demonstration
- Production & Development
- Operations& Support

The five phases are explained in more detail in paragraphs 2.3.1 through 2.3.5 below.

Capability gaps must first be evaluated to determine if they can be satisfied by non-materiel solutions. Non-materiel solutions include changes in doctrine, organization, training, leadership and education, personnel and facilities (DOTLPF). When a need cannot be met by such changes, a broad statement of mission—expressed in terms of an operational capability (not a system-specific solution)—is identified in the ICD. Approval of the ICD is gained at Concept Refinement. Approval of the Concept Refinement does not yet mean a new acquisition program. The approval authorizes initiation to explore Analysis of Alternatives (AoA). Approval of the Concept-Refinement Phase (Milestone A) authorizes entry into the Technology Development Phase that examines technology risk and appropriate technology to be incorporated into the system. (Approval to proceed into the Technology Development Phase (Milestone B) typically launches the chartering of a PM and system development). The CBTDEV, MATDEV, Army Research Laboratory-Human Research and Engineering Directorate (ARL-HRED) System Lead and system MANPRINT Action Officer should attend all system ICDT meetings to ensure

MANPRINT Domain Constraints are captured in the ICD. See <u>CJCSI 3170.01C</u> and <u>DoDI</u> 5000.2



# 2.3.1 Concept Refinement

The system acquisition starts with the Concept Decision in the Concept Refinement Phase. The ICD shall guide Concept Requirement. The ICD and the AoA establishes the need for a materiel approach to resolve a specific capability gap. The ICD also supports the Technology Development Strategy (TDS), the Milestone A acquisition decision, and subsequent Technology Development phase activities. The AoA should consider MANPRINT impacts on cost, schedule and performance pertaining to each of the alternatives. The capability gap is defined in terms of functional area(s). The ICD should illustrate the evaluation of different materiel approaches that were proposed to provide the required capability. The ICD proposes the recommended materiel approach(es) based on analysis of the relative cost, efficacy, sustainability, environmental quality impacts, and risk posed by the materiel approach(es) under consideration all to be captured in the ICD. The ICD is not updated after Milestone A approval.

# 2.3.2 Technology Development

This phase is used to reduce technology risk and determine the appropriate set of technologies to be integrated into a full system. Technology Development is a continuous technology discovery and development process reflecting close collaboration between the Science and Technology (S&T) community, the user, and the system developer. It is an iterative process designed to assess the viability of technologies while simultaneously refining user requirements. The project shall enter Technology Development at Milestone A when the Milestone Decision Authority (MDA) has approved the TDS. A favorable Milestone A decision does not mean that a new acquisition program has been initiated. Multiple technology development demonstrations may be necessary before the user and developer agree that a proposed technology solution is affordable, militarily useful, and based on mature technology. Recommend reviewing any MANPRINT goals and constraints in the ICD, and Key Performance Parameters (KPPs), and when crosswalking them into the draft CDD.

#### 2.3.3 System Development and Demonstration (SDD)

Milestone B approval marks the beginning of this phase. It is at this point that an acquisition program is initiated and a Program Manager is appointed and assumes responsibility for system development. The purpose of the SDD phase is to develop a system or an increment of capability; reduce integration and manufacturing risk (technology risk reduction occurs during Technology Development); ensure operational supportability with particular attention to reducing the logistics footprint; implement HSI; design for producibility; ensure affordability and the protection of Critical Program Information (CPI) by implementing appropriate techniques such as anti-tamper; and demonstrate system integration, interoperability, safety, and utility. Entrance into this phase requires a CDD, which states the operational and support-related performance attributes of a system that provide the desired capability required by the warfighter-- attributes so significant that they must be verified by testing and evaluation. The CDD provides the operational performance attributes, including supportability, necessary for the acquisition community to design the proposed system, including KPPs that will guide the development, demonstration and testing of the current increment. The document shall identify the specific attributes contributing most significantly to the desired operational capability, in thresholdobjective format.

# 2.3.4 Production and Deployment

The purpose of this phase is to achieve an operational capability that satisfies mission needs.

#### 2.3.4.1 Production and Deployment Activities

Operational test and evaluation shall determine the effectiveness and suitability of the system. The MDA makes the decision to commit DoD to production at Milestone C. Milestone C authorizes entry into Low Rate Initial Production (LRIP) (a major Decision Point for Major Defense Acquisition Program (MDAP) and major systems), into production or procurement (for non-major systems that do not require LRIP) or into limited deployment in support of operational testing for Major Automated Information System (MAIS) programs or software-intensive

systems with no production components. Entrance into this phase depends on the following criteria: acceptable performance in development, test and evaluation and operational assessment; mature software capability; no significant manufacturing risks; manufacturing processes under control (if Milestone C is full-rate production); an approved ICD (if Milestone C is program initiation); an approved CPD; acceptable interoperability; acceptable operational supportability; compliance with the DoD Strategic Plan; and demonstration that the system is affordable throughout the life cycle, optimally funded, and properly phased for rapid acquisition. The CPD reflects the operational requirements resulting from SDD and details the performance expected of the production system. If Milestone C approves LRIP, a subsequent review and decision shall authorize full-rate production.

# 2.3.4.2 Low Rate Initial Production (LRIP)

LRIP is intended to result in completion of manufacturing development in order to ensure adequate and efficient manufacturing capability and to produce the minimum quantity necessary to provide production or production-representative articles for Initial Operational Test and Evaluation (IOT&E), establish an initial production base for the system; and permit an orderly increase in the production rate for the system, sufficient to lead to full-rate production upon successful completion of operational (and live-fire, where applicable) testing.

# 2.3.4.3 Full Rate Production and Deployment

Continuation into full-rate production results from a successful Full-Rate Production Decision Review by the MOA (or person designated by the MDA). This effort delivers the fully funded quantity of systems and supporting material and services for the program or increment to the users. During this effort, units shall attain Initial Operational Capability (IOC).

# 2.3.5 Operations and Support

The objective of this activity is the execution of a support program that meets operational support performance requirements and sustains the system in the most cost-effective manner over its total life cycle. Paragraphs 2.3.5.1 through 2.3.5.3 contain information extracted from <a href="DoDI 5000.2">DoDI 5000.2</a>. The underlined text below indicates the importance and impact that HSI/MANPRINT has and the final result for deployment and sustainment of a System, FoS or SoS.

# 2.3.5.1 System Sustainment

Sustainment includes supply, <u>maintenance</u>, transportation, sustaining engineering, data management, configuration management, <u>manpower</u>, <u>personnel capability</u>, <u>training</u>, <u>habitability</u>, <u>survivability</u>, <u>environment</u>, <u>safety</u> (including explosives safety), <u>occupational health</u>, protection of critical program information, anti-tamper provisions, and Information Technology (IT), to include National Security Systems (NSS), <u>supportability</u> and interoperability functions.

#### 2.3.5.2 Effective System Sustainment

Effective sustainment of weapon systems begins with the design and development of reliable and maintainable systems through the continuous application of a robust systems engineering methodology. As a part of this process, the PM shall employ human factors engineering to design systems that require minimal manpower; provide effective training; can be operated and maintained by users; and are suitable (habitable and safe with minimal environmental and occupational health hazards) and survivable (for both the crew and equipment).

#### 2.3.5.3 Optimize Operational Readiness

PMs shall <u>optimize operational readiness</u> through affordable, integrated, and <u>embedded diagnostics</u> and <u>prognostics</u>; embedded training and testing; serialized item management; Automatic Identification Technology (AIT); and iterative technology refreshment.

2.4 Integrated Capability Development Teams (ICDTs) and Integrated Product Teams (IPTs)

# 2.4.1 ICDT/IPT Policy

**DoDD 5000.1**. DoDD 5000.1, Enclosure 1, paragraph E1.2

**DoDI 5000.2.** DoDI 5000.2, paragraph 3.4.1

**AR 70-1**. Army Acquisition Policy (research, development and acquisition)

AR 602-2. Manpower and Personnel Integration (MANPRINT) in the System Acquisition Process

**DA Pam 70-3**. Army Acquisition Procedures

TRADOC Reg 71-20. Capabilities Integration and Development System

**TRADOC Pam 71-20.** Operation of the Capabilities Integration and Development System

# 2.4.2 The Integrated Capability Development Team (ICDT)

The decision to acquire a new system is actually the end product of the Joint Capabilities Integration and Development System (JCIDS) analysis process that is composed of a structured, four-phased methodology that defines capability gaps, capability needs, and solution sets within a specified functional area. Based on national defense policy and centered on a common joint warfighting construct, the analyses understanding of joint force operations and DOTMLPF capabilities and deficiencies. The JCIDS analyses and performed by the sponsor and provide the necessary information for the development of the ICD. This vision is translated into a more detailed concept by ICDTs. The TRADOC Futures Center (FC) establishes integrated capabilities development teams, supported by TRADOC and non-TRADOC proponents, to develop concepts/CCPs, conduct the capabilities-based assessment, and prepare capability documents. In coordination with the TRADOC staff, the TRADOC FC directs, integrates, and

manages the efforts of the ICDTs and the TRADOC and non-TRADOC proponents as they develop capabilities for the Army.

Although the TRADOC staff, major subordinate command, TRADOC and non-TRADOC proponents, and the TRADOC Analysis Center (TRAC) all contribute to capabilities integration and development, TRADOC uses a collaborative approach to concept and capabilities development. The ICDTs maximize the efforts of reduced resources by early resolution of issues through timely involvement of appropriate agencies/expertise as a team with a commitment to aggressively identify and work issues. TRADOC employs multi-disciplinary ICDTs to shorten the JCIDS/CIDS and acquisition processes through the early, collaborative involvement of key stakeholders and SMEs, ICDT membership includes appropriate representation from the TRADOC staff, the TRADOC FC, TRAC, TRADOC and non-TRADOC proponents, RDECOM (AMSAA and RDECs), Army major commands (MACOM) the ARSTAF, JFCOM and other combat commands (COCOM) as required, appropriate DoD organizations and other federal agencies. Industry and academia may participate on a limited basis. ARL-HRED field elements will have the lead for participating and coordinating MANPRINT expertise. See AR 602-2, paragraph 3-7.

The ICDT chair (chartered proponent), the deputy chair (O6), the core membership, and the staffing membership are the elements of an ICDT.

- 1. Led by the deputy chair, the core members serve as the ICDT nucleus. The core members develop the concept, conduct the capabilities-based assessment, and develop the capability documents. On-call members provide input to the product and assist in resolution of issues and adjudication of comments within their subject matter expertise, or provide experimental, analytical, operational, and technological advice and support to the dedicated core team.
- 2. The staffing members review the initial draft of the concept/CCP, the results of the capabilities-based assessment, and the resulting capability documents and submit their issues and comments. Adjudication of comments/issues to the satisfaction of the staffing member constitutes concurrence by that member's organization. Unresolved issues from either the core or staffing members constitute a non-concurrence by that member's organization and are addressed and resolved during the approval process.
- 3. The ICDT membership and participants vary, depending on the specific product; however, core membership always includes representation across the DOTMLPF domains. The ICDT charter identifies the membership, the participating organizations, and the expected deliverables. While industry and academia are not members of the ICDT, their input is a key to the process. Techniques to obtain industry and academia input must be executed properly to avoid significant consequences for government, academia, and industry participants.

#### 2.4.3 The Integrated Product Team (IPT)

One of the first actions taken by the PM will be the formation of IPTs. At the PM level, there are generally two types: Working Level IPTs (WIPTs) and the Integrating Integrated Product Team (IIPT). The first team to be formed is the IIPT, and at least some of the members of the ICT and

the MATDEV's IPT will transition over to the IIPT. The IIPT assists the PM in determining a structure for the WIPTs (e.g., which WIPTs should be formed, who should participate, and how much support is needed). The PM may appoint an Integrated Logistics Support (ILS) Manager and a MANPRINT Manager or the same individual may be dual-hatted.

One of the WIPTs that may be recommended, based on needs or issues, at this point is the MANPRINT WIPT. As with the transition from the new system ICT to the IIPT, the MANPRINT WIPT should contain MANPRINT members who have transitioned from the ICT. This structure ensures continuity throughout the acquisition process. In cases where a MANPRINT WIPT is inappropriate or unsupported, MANPRINT must be represented on another WIPT(s). ARL-HRED coordinates MANPRINT issues and activities.

The same basic process holds true for automated information systems, even when TRADOC is not the system proponent. The Functional Proponent would perform similar functions to that of a CBTDEV/ICDT as described in TRADOC Pamphlet 71-20.

# **CHAPTER 3**

#### 3.0 TAILORED MANPRINT SUPPORT

# 3.1 Purpose

The nucleus of MANPRINT support is the MANPRINT Team consisting of MANPRINT domain experts with responsibilities to support ICTs and PM IPTs. ARL-HRED will act as focal points for ensuring that appropriate domain experts are available to support the program.

The MANPRINT Team representation on ICDTs, will depend upon the estimated MANPRINT impact and availability of resources. Typically ARL-HRED will provide the MANPRINT representative and will be empowered to act, having the information required to proactively represent the domains that may not have a subject matter expert among the core ICDT membership. Prior to the Concept Refinement Phase, the MANPRINT Team should determine the extent and nature of their involvement in the ICDT and inform the ARL-HRED representative. Working in tandem with the new system ICDT, this group should focus on MANPRINT risks as the various alternatives are evaluated and explored. As part of their efforts, the MANPRINT Team should formulate MANPRINT risks, thresholds and objectives for the ICD, CDD, and CPD. Particularly for non-major Acquisition Category (ACAT) III systems, a MANPRINT Team can (and often does) consist of a single MANPRINT AO at TRADOC supporting ARL-HRED office. This individual must define what MANPRINT domains are the most operative for an anticipated system and address them in requirements documents: in most cases, this person's responsibilities and efforts are augmented by enlisting the expertise of other ARL-HRED or discipline-specific (extra-HRED) professionals. This process will be discussed in greater detail in Chapter 5. The issues identified by the efforts of the team should be tracked by the ARL-HRED developed tracking system (see Chapter 4).

When a program is initiated (MS B, normally), the PM should form a MANPRINT WIPT if it is a major system and there is the possibility of significant MANPRINT issues. Otherwise, MANPRINT should be represented on any broader WIPT such as a Supportability WIPT. Ideally, many of the members of the ICT will transition over to the MANPRINT WIPT. This allows for continuity in the MANPRINT program. As with the ICT, ARL-HRED will provide the focal point.

# 3.2 Key Members

The recommended composition of the MANPRINT Team is a matter of system-specific/situation-specific need. The following is the list of MANPRINT Team agencies and their functional expertise. For a listing of individuals and addresses, select CONTACTS on the MANPRINT Web page:

AGENCY	FUNCTIONAL EXPERTISE
MANPRINT Directorate, Office of the Deputy Chief of Staff G-1, Department of the Army (DA)	MANPRINT process and policy
U. S. Army Research Laboratory - Human Research and Engineering Directorate (ARL-HRED)	Human Factors Engineering. Overall MANPRINT Focal Point, Soldier Survivability, and MPT (for non-major systems).
U.S. Army Human Resources Command (HRC), Deputy Chief of Staff for Operations (DCSOPS), Force Integration Division, MPT Domain Branch	Manpower, Personnel Capabilities, Training (for ACAT I and II systems).
U. S. Army Research Laboratory - Survivability\Lethality Analysis Directorate (ARL-SLAD)	Soldier Survivability (for ACAT I and II systems)
U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM)	Health Hazards
U.S. Army Training and Doctrine Command (TRADOC)	User Representative
U.S. Army Combat Readiness Center (for materiel systems)	Materiel System Safety
U.S. Army Materiel Command (AMC)	System Safety (for ACAT III and AIS systems).

Figure 3.2-1. Key Members of the MANPRINT Team

# 3.3 Participants

Often, the core group possesses expertise in more than one of the MANPRINT domains. However, like other Army agencies, they do not have sufficient resources to fully participate in all aspects of all systems. Because of this, ARL-HRED's responsibility as focal point is key. Even though the entire MANPRINT Team may not physically participate, they should provide subject domain expertise input to ARL-HRED, the ICDT and/or IPT. There may be other participants in an ICDT or IPT having MANPRINT related domain expertise who can also fill any void created by the reduced participation by the MANPRINT Team. Examples of such participants include: (This is not intended to be exhaustive but rather examples.)

AGENCY	FUNCTIONAL EXPERTISE
Deputy Under Secretary of the Army (Operations Research) (DUSA(OR))	MANPRINT and test and evaluation
Deputy Chief of Staff G-4	Logistics
Deputy Chief of Staff G-3	Force Structure
U. S. Army Test and Evaluation Command	MANPRINT and test and evaluation
U. S. Army Training and Doctrine Command:	
Combat Development	Manpower
Training Developers	Training
Personnel Proponent	Personnel
U.S. Army Information Systems Management Activity (USAISMA)	Logistics (AIS)
U.S. Army Intelligence and Security Command (USAI&SC)	System Security
U. S. Army Materiel Command Surgeon	Health Hazards
Industry	All domains, as needed

Figure 3.3-1. Potential Participants with MANPRINT Expertise in ICTs and IPTs

In addition to the agencies listed above, functional experts from the PM, CBTDEV, TNGDEV, and/or FP, and TRADOC System Manager (TSM) need to participate and actively support MANPRINT. These are people who are actually designing/developing the system and who will ultimately interact with it. Their knowledge and insights are absolutely invaluable, and they can carry MANPRINT principles into the acquisition process on a daily basis, serving as informal MANPRINT representatives. Such individuals may include, but not be limited to, the ILS Manager, Systems Engineer, and the Test and Evaluation Manager.

There are a number of actions that should be accomplished once a MANPRINT WIPT has been established. A draft MANPRINT WIPT charter should be prepared and distributed to members for comment and approval. The purpose of this document is to define responsibilities, ensure understanding, and promote a feeling of ownership. There are no formal regulations calling for this, and there is no prescribed format. At a minimum, it should define the purpose, membership, objectives, and procedures of the group. A sample charter is provided at Appendix E.

#### **CHAPTER 4**

#### 4.0 MANPRINT MANAGEMENT

The DoD recognizes the critical importance of management control. Rigorous internal management control systems are integral to effective and accountable program management. The objective is to perform acquisition functions efficiently and effectively while maximizing the utilization and protection of resources. <u>DoDI 5000.2</u>, <u>E7</u>, directs PMs to have a comprehensive plan for HSI in place early in the acquisition process. Army programs will use a MANPRINT Plan to fulfill this requirement. It further directs the HSI planning be summarized in the acquisition strategy. (For further information, please see <u>DoDI 5000.2</u>, <u>E7</u>.)

#### 4.1 MANPRINT Plan

A MANPRINT Plan is a planning and management tool that outlines the MANPRINT management approach, associated decision and planning efforts, user concerns and identification and states resolution of MANPRINT risks during system acquisition. Identification and documentation of these risks early in the acquisition cycle increases the probability of their resolution.

The MANPRINT Plan should serve as the management strategy for the MANPRINT effort to ensure human considerations are effectively integrated into the development and acquisition of Army systems. It should contain the MANPRINT strategy, as well as a listing, status, and audit trail for MANPRINT risks. Other elements may be included as appropriate (e.g., the TAD; a MANPRINT IPT or MANPRINT Joint Working Group (MJWG) Charter; Manpower Estimate (ME); and the MANPRINT Domain Point of Contact (POC) information; as well as the CBTDEV, MATDEV, TNGDEV, and test evaluation POCs). For identified risks, data on MANPRINT costs (i.e., analyses and support) and benefit (i.e., cost savings and cost avoidance) must be captured and addressed in trade-off analyses. The MANPRINT Plan provides crucial information to the test community and assists in the development of the TEMP and Test Plans.

# 4.2 MANPRINT Risk Tracking

Part of the MANPRINT Plan included the identification and tracking of risks. An example of a Risk Identification Form is at Appendix G. These risks are then used to set-up a tracking system.

#### 4.3 MANPRINT Crosswalks

The MANPRINT AO should crosswalk all MANPRINT requirements against the ICD, CDD, CPD, MANPRINT Plan, STRAP, TEMP, and Acquisition Strategy.

The CDD requirements are in the Chairman of the Joint Chiefs of Staff Manual (CJCSM) 3170.01A; Enclosure E and the format is in Enclosure E, Appendix A. It is important to note that the number of KPPs for the CDD do not normally exceed eight. Coordinate with the ARL-

HRED system MANPRINT lead, MANPRINT Domain agencies, and the CBTDEV/FP to ensure the necessary requirements are captured.

The requirements of the CDD/CPD should also provide the basis for testing issues in the TEMP. MANPRINT AOs must ensure this process is used to manage MANPRINT requirements, for both thresholds and objectives. When a specific MANPRINT requirement, is not addressed in the TEMP, it should be brought to the attention of the CBTDEV and MATDEV. The MANPRINT requirements should also be crosswalked to the Supportability Strategy.

# **CHAPTER 5**

#### 5.0 ACTIVITIES OCCURRING DURING SYSTEM LIFE CYCLE PHASES

There is a possibility that the MANPRINT and Logistical Supportability meetings could be combined together as a Supportability Integrated Product Team (SIPT). This could happen because the members of both IPTs are usually the same people and every effort should be made to stay within the system's budgetary constraints. Should this happen, substitute Supportability IPTs for MANPRINT IPTs.

There is also a checklist available to the MANPRINT AO in <u>AR 602-2</u>, Appendix C, Management Control Evaluation Checklist for the Manpower and Personnel Integration. Use this as a blueprint to inform the PM and other MANPRINT Managers to evaluate the MANPRINT processes and status in system development.

Text underlined in blue are linked to Chapters and Appendices in the MANPRINT Handbook as well as web sites. HRC uses a secure web site, if you are not on a secure government operated computer network, you will have to copy the web address to your internet browser and select "Go" to gain access.

There is also a DoD Acquisition Model at Appendix I with some of the MANPRINT processes included.

Certain activities should be accomplished in each life cycle phase for MANPRINT to exercise its full potential in the acquisition process. Prior to the Concept Decision Point for Concept Refinement and MS A, activities focus around establishing the MANPRINT program as a part or extension of the related ICDT. During the Concept Refinement Phase, events move rapidly and numerous activities (discussed in detail later in this chapter) occur. Prior to a favorable MS A decision, MANPRINT should address these actions. The appropriate ARL-HRED Field Element will normally be the focal point complimented with other MANPRINT domain representatives as available.

The MDA may authorize entry into the acquisition system at any point, consistent with phase-specific entrance criteria and statutory requirements. However, for most programs the entrance point is MS B, which is also the initiation of an acquisition program and when a PM is designated. The PM will form an IIPT to help formulate recommendations regarding the structure and composition of WIPTs for the new program. An IIPT coordinates all WIPT efforts and covers all topics not otherwise assigned to another WIPT. One of these should be the MANPRINT WIPT, and the PM should appoint a MANPRINT Manager (may also be the ILS Manager). This individual should then be responsible for ensuring that necessary MANPRINT activities are accomplished in the day-to-day functioning of the PM Office. It could also be the MANPRINT AO who initiates all MANPRINT tasks while working for the CBTDEV/FP. It should be stated, however, that the CBTDEV, FP, TSM, MANPRINT AO, and PM must develop a synergy in working with each other. They all share an equal responsibility for ensuring that MANPRINT considerations are addressed during the acquisition process.

This section contains basic activities that may occur in the acquisition program. PM responsibilities for MANPRINT/HSI are found in <a href="DoDD 5000.1">DoDD 5000.1</a>, <a href="DoDD 5000.2">DoDI 5000.2</a> and <a href="AR 602-2">AR 602-2</a>. The activities in this section are presented as being initiated during the system's life cycle and in particular acquisition phases. This is, however, only one of many possible scenarios. In reality, an action can be initiated when the PM deems it necessary, anytime during the process, or may not be initiated at all. It will be up to the MANPRINT AO to ascertain which of the activities pertain to her/his particular program and when they are occurring. For the sake of brevity and efficiency, detailed guidance is provided only for the phase in which the activity is first presented.

Additionally, establish a plan that executes the request for a MANPRINT Assessment (MA) six to nine months prior to the time that the PM needs the MA for the system milestone decision package. A great deal of coordination is required by the MANPRINT Domain Agencies to prepare the MA to support the MDR.

A high-level outline of Section 5.0 is presented below for convenience.

- 5.1 Activities Occurring in All Phases (This section contains activities that are general in nature, and not necessarily tied to any one phase.)
- 5.2 Activities Occurring Prior to the Concept Decision Point of the Concept Refinement Phase
- 5.3 Activities Occurring During the Concept Refinement Phase to Achieve a MS A Decision
- 5.4 Activities Occurring During the Technology Development Phase to Achieve a MS B Decision
- 5.5 Activities Occurring During the System Development and Demonstration (SDD) Phase to Achieve MS C
- 5.6 Activities Occurring During the Production & Deployment Phase
- 5.7 Activities Occurring During the Operation and Support Phase

Guidance is provided on how to accomplish each activity, and why it is important. (This guidance is not necessarily comprehensive. MANPRINT AOs may become involved in other system/situation-specific activities, or may develop other methods to accomplish them.) Where relevant, references are made to documents containing additional information. Appendix C of this guide contains a list of these documents with brief synopses of their contents and guidance on how to obtain them.

# 5.1 General MANPRINT Activities During System Acquisition

# 5.1.1 Communicate and Follow-up

WHY? Frequent communication with the people designing, testing and developing the system is the surest way to gain influence in the process. It provides day-to-day visibility, establishes credibility, and builds trust.

Many important decisions are made informally, and the results are presented at formal reviews. At that point, however, it may be too late to make any changes. Remember: silence can be perceived as concurrence.

Open lines of communication with people guiding related efforts (e.g., testing, supportability) help to ensure that MANPRINT risks are crosswalked into those processes.

HOW? Coordinate with ICT/IPT POCs within the CBTDEV/FP, MATDEV, TSM, and PM Offices for systems engineering (hardware and software), logistics, training, documentation, program scheduling, testing, and fielding. Inform the lead POC in these areas that you are an AO for MANPRINT. Explain who is working with you and what their MANPRINT responsibilities are. Discuss any potential MANPRINT issues, perceived at that time, that warrant special consideration or analyses.

Find out who is working for them and what their individual functional responsibilities are. Explain to the lead POC/Subject Matter Experts (SMEs), when necessary, what MANPRINT is and why it is important.

Explain how you can help them and how they can help you. Exchange schedules and check schedules against the master program schedule. Make it a point to talk to people as the program progresses.

Attend informal and formal meetings (e.g., ICTs, IPTs, in-house In-Process Reviews (IPRs), T&E IPTs, design reviews).

# 5.1.2 Coordinate Meetings and Agendas for MANPRINT

WHY? MANPRINT team members possess the functional expertise necessary to assess the overall MANPRINT status of the system.

HOW? Determine when a meeting of the MANPRINT Team on the ICT or MANPRINT WIPT is scheduled to discuss risks and solutions. Formulate an agenda on topics to be addressed by the working group. Establish a set of tentative times and dates for the meeting. If possible, this should be planned in conjunction with other scheduled meetings to reduce resource costs.

Forward your recommendations and the proposed agenda to the CBTDEV/FP, TSM and/or MATDEV/PM (as appropriate). Offer to meet to discuss why you think the meeting is necessary. Upon approval:

- Send the agenda to group members. Coordinate meeting time. Put together a package of read-ahead material for prior review. The package should contain all relevant program/requirements documentation along with any reports/observations you have on program status. Allow sufficient time before meeting for review.
- Maintain a library of important program requirements and testing documentation for the MANPRINT Team. For those individuals who cannot attend, request that written input be provided, or arrange for telephonic/electronic participation.
- Recommend to the CBTDEV/FP, TSM, and/or MATDEV/PM the assignment of responsibilities for investigation/resolution of identified MANPRINT risks. Establish timelines (in keeping with the master program schedule) for resolution of risks.

Publish minutes along with POC information and action items. An action items checklist should have due dates, name of person or persons responsible and in what form the product will be delivered. Provide copies to the working group, FP/CBTDEV/TSM and MATDEV/PM, and to key individuals in their respective offices.

Maintain a liaison with group members after the minutes are distributed.

#### 5.1.3 Keep the MANPRINT Team Informed

WHY? The Team must be kept up-to-date and well-informed to allow members to apply their expertise on a timely and efficient basis.

HOW? Contact group members when issues/risks arise.

Provide drafts of program documentation when available. Allow sufficient time for members' comments to be incorporated, when relevant.

On a periodic basis, prepare an update for distribution to group members informing them of program status, changes, and issue resolution. Distribution may be accomplished via electronic means.

Provide members with an up-to-date program calendar of events and system timelines.

Arrange for Team members to observe the actual system, possibly at a test bed site or at other test events. If possible, coordinate meetings with other scheduled meetings (e.g., IPTs on Supportability, Testing, Systems Engineering; ICTs on system concepts and alternatives) and/or other system reviews to reduce travel costs.

# 5.1.4 Establish and Maintain a MANPRINT Support File for All Relevant MANPRINT Data, Analyses, Studies, and Documentation

WHY? The MANPRINT Support File will constitute an important audit trail for the MANPRINT Program.

The data, analyses, assessments, test findings, studies, and documentation used and generated by the MANPRINT program during one phase may have to be consulted or used in a later phase.

HOW? Set aside a central repository for collecting and saving MANPRINT-related information. Examples of contents may include:

- Tables of Organization and Equipment (TOE)/Tables of Distribution and Allowances (TDA)
- Lessons Learned Data
- MANPRINT Plans
- Reliability, Availability, & Maintainability (RAM) data
- Logistic Support Analysis Record (LSAR) data
- Operational Concept information
- MANPRINT domain Assessment Reports
- Minutes of MANPRINT WIPT meetings and other meetings attended
- Data on Target Audience
- Test and Evaluation Reports (TER)
- AoA and Operational Training Analyses results
- MANPRINT Analyses results
- Basis of Issue Plan Feeder Data (BOIPFD)
- Preliminary manpower information in Consolidated Acquisition Reporting System (CARD) documents
- ME (When applicable)
- MAs
- STRAP
- ORD from predecessor system, CDD and CPD
- Keep a bibliography of the information in the file. You may want to assign a numbering system to assist in identifying what the information was used for.

# 5.1.5 Review Existing Program Documentation, Data, and Lessons Learned to Ensure that MANPRINT is Crosswalked Where Relevant/Required

WHY? Participants in the acquisition process rely on the data and documentation that is produced to guide the design/development process and to keep track of scheduled events. The information that is provided must, therefore, be up-to-date, correct, and consistent both internally and across functional areas.

NOTE: See Section Chapter 4 for a discussion on crosswalking.

#### HOW?

- Coordinate with the POC for each document/data source that requires MANPRINT input/review. Obtain copies of current drafts/documents.
- Determine whether the information should be reviewed by members of MANPRINT Team. If so, provide to members. Where needed, provide MANPRINT inputs.
- Review documents, data, and lessons learned. Provide comments.
- As necessary, identify MANPRINT risks arising from the reviews to be discussed by MANPRINT working groups.

# 5.1.6 Provide Input to Models and Simulations

WHY? Modeling and simulation planning is an integral part of system development. Accredited modeling and simulation shall be applied, as appropriate, throughout the system lifecycle in support of the various acquisition activities: requirements definition; program management; design and engineering; efficient test planning; result prediction; and to supplement actual test and evaluation; manufacturing; and logistics support. PMs shall integrate the use of modeling and simulation within program planning activities, plan for life-cycle application, support, and reuse models and simulations, and integrate modeling and simulation across the functional disciplines. Management of the identification, review, and approval of Models and Simulations (M&S) is based on three domains: Advanced Concepts and Requirements (ACR) (concept evaluations, requirements determination, tactics, and doctrine); Research, Development and Acquisition (RDA) (technology development and evaluation, system development, test and evaluation, and force modernization); and Training, Exercise, and Military Operations (TEMO) (individual, crew, and unit training, command and battle staff training, mission planning, mission rehearsal, and joint operations). Some M&S serve more than one domain. Simulation Support Plans (SSPs) are created from concept exploration through full system development to implement the Army's Simulation and Modeling for Acquisition, Requirements, and Training (SMART) objectives. The purpose of a SSP is to provide a tool to use in thinking through modeling and simulation requirements throughout the acquisition life cycle to reduce time, resources, and risk, as well as improve program implementation. SSP guidelines are available on the Internet at http://www.sarda.army.mil/zd. Any program includes four functional areas: engineering development, combat development, test and evaluation, and training. The Army Model and Simulation Office (AMSO) under the Army's G-3 is the central management office. This discussion addresses the Army's M&S program. It does not address models and simulations developed by contractors in the development systems. Many of these may be proprietary in nature and in the case of commercial/non-developmental systems, may have been used prior to the Army's involvement.

HOW? MANPRINT AOs must continuously ensure that the human operators, maintainers, and supporters are considered in the development of system models and simulations. The fact that a component will physically fit in a contractor model does not mean that it can be operated or maintained by the target audience. M&S provides the opportunity for a myriad of "what if" exercises without bending metal. If used wisely, they can greatly expedite the acquisition process

and enhance total system performance. Early development of MANPRINT thresholds, objectives, and performance parameters (especially KPPs), will provide the baseline needed to insert the human dimension. M&S can facilitate continuous evaluation and help reduce or eliminate subsequent system testing, improve evaluations and reduce costs. System simulations and models required for testing and/or evaluation must be listed in the TEMP. Simulations can now be developed that address some of the concerns of SoS. The need for "human-in-the-loop" does not diminish with the sophistication of models.

### 5.1.7 Participate in the T&E WIPT/Test and Evaluation Master Plan (TEMP) Development

WHY? The T&E WIPT is formed by the MATDEV. The purpose or goals of the T&E WIPT are to:

- Develop a mutually agreeable T&E program that will provide the necessary test data for evaluations;
- Provide for development, staffing, coordination, and approval of all required T&E documentation;
- Establish the necessary subordinate working groups (subgroups) to address related T&E issues;
- Assure that all participants have the opportunity to be involved and are not excluded;
- Establish and manage the corrective action process;
- Participate in Developmental Test Readiness Reviews (DTRRs) and Operational Test Readiness Reviews (OTRRs); and
- Support the integrated T&E.

The initial T&E WIPT meeting should be held together with a review of the ICD and possibly a draft CDD. In developing the TEMP, the CDD requirements must be crosswalked (just like they will be in RFP development). The TEMP has a mandatory format and is required for MS B and C and the Full-Rate Production (FRP) decision (DoDI 5000.2, Enclosure 5).

The combat developer is responsible for development of Critical Operational Issues and Criteria (COIC) upon which the operational T&E of the system will proceed.

The T&E process will provide the final validation that the total system is operationally suitable and survivable. To achieve this, all aspects of the human must be considered via the seven domains.

HOW? MANPRINT AOs should actively participate in the T&E WIPT. Key portions of the TEMP must have MANPRINT issues included (as a result of crosswalk from the CDD/CPD). For example:

The critical operational effectiveness and suitability parameters and constraints include manpower, personnel, and training. As discussed with the CDD/CPD, performance parameters should include the hardware and software components, the soldier, and the environment.

Measures Of Effectiveness (MOE) and Measures Of Performance (MOP) should include the soldier as part of the system. Operational tests must evaluate the system with typical users and maintainers.

MANPRINT requirements must be contained in the CDD/CPD and associated KPPs to be included in the RFP and other contractual documents, as well as, addressed in test and evaluations.

Operational test and evaluation will be the final validation that MANPRINT has or has not been successfully implemented in the system acquisition. Later, MANPRINT experts may be able to identify additional operational issues and criteria that should be included in Detail Test Plans (DTP).

Additional information on Testing is contained in: <u>DA Pam 73-1: Test and Evaluation in Support of System Acquisition</u>

# 5.1.8 Participate in the Supportability Integrated Product Team (SIPT)

WHY? MANPRINT and supportability are mutually supportive efforts. There are many MANPRINT-related supportability considerations, and many of the outputs of MANPRINT and supportability studies and analyses (e.g., Supportability Analysis (SA) in AR 700-127) can meet data requirements of the other discipline. The two efforts must be closely coordinated to ensure that all needed data is produced, that vital information is shared, and that no redundancy exists in data collection and analysis.

**HOW?** Coordinate with the Supportability Manager (who may also be the MANPRINT Manager).

- Visit web site of the AMC for the latest updates to policy and guidance.
- Obtain a schedule of planned ILS activities and milestones.
- Participate in SIPT meetings.
- Provide MANPRINT inputs (e.g., manpower, personnel, and training issues) to the Supportability Strategy. Coordinate with the ILS Manager on data requirements and activities. Take into consideration Additional Support Items of Equipment (ASIOE) and each ILS element.
- Ensure there is not a redundancy of effort (and resource expenditure) on studies and analyses.
- Review ILS requirements in the RFP/contract.
- Invite the ILS Manager to MANPRINT WIPT meetings.

# 5.1.9 Participate in Integrated Product Teams (IPTs) and Integrating IPTs (IIPTs)

WHY? IPTs and IIPTs form the nucleus of the acquisition program. They are composed of representatives from all appropriate functional disciplines, working together to build a successful

system. The MANPRINT AO must interact closely with IPTs to ensure MANPRINT is given full consideration. One or more IPTs may be established early in the acquisition by the MATDEV (a commodity command or the PM-designee). These IPTs will support the combat developer in early analytical efforts and provide essential system-related data. The IPTs will also help transition primary responsibility for the system from the combat developer to the PM. IPTs operate under the following broad principles:

- 1. Open discussions with no secrets.
- 2. Qualified, empowered team members.
- 3. Consistent, success-oriented, proactive participation.
- 4. Continuous "vertical and horizontal" communications and networking.
- 5. Reasoned argument.
- 6. Issues raised and resolved early.

HOW? MANPRINT AO participation in IPTs as well as ICDTs helps ensure MANPRINT risks, thresholds, and aspects of KPPs are transitioned to the PM. MANPRINT representatives should assist in the preparation of the ICDT Products and Documents which will include MANPRINT issues. In addition, MANPRINT representatives should begin to justify the need for a MANPRINT WIPT, the makeup of the Team, and its roles and responsibilities, if appropriate. MANPRINT domain representatives should initiate development of resource requirements for analyses and assessments.

# 5.1.10 Assist the MATDEV/PM in Developing the Acquisition Strategy

WHY? The acquisition strategy serves as the roadmap for program execution from program initiation through post-production support. A primary goal in developing an acquisition strategy is to minimize the time and cost of satisfying an identified, validated need, consistent with common sense and sound business practices. The MATDEV/PM must consider all prospective sources with priority to commercial and non-developmental items. Cost/performance tradeoff analyses must be conducted before an acquisition approach is finalized. The best time to reduce life-cycle costs is early in the acquisition process and the human element is, in most cases, the predominant high driver for operation and support costs.

HOW? The MATDEV/PM should coordinate the acquisition strategy with MANPRINT support organizations. The PM is directed by DoDI 5000.2 to summarize his HSI (i.e., MANPRINT planning in his acquisition strategy). Hence, MANPRINT may be a pivotal factor in the strategy development. The preferred program concept and acquisition strategy are selected after consideration of the associated technical and managerial considerations, risks, schedule, and costs. MANPRINT is integral to all of these. Potential MANPRINT implications of alternative concepts that should be reviewed by MANPRINT domain experts to ensure MANPRINT-related requirements and thresholds required by the CDD are addressed and met by selected concepts.

# 5.1.11 Support Warfighting Rapid Acquisition Programs (WRAP)

WHY? WRAP implements the Army's accelerated procurement of systems identified through TRADOC warfighting experiments as compelling successes which satisfy urgent needs. Sub

elements of WRAP include: AWEs, ATDs, and ACTDs. It is implemented within existing Army structures and organizations. It is a process that links TRADOC experimentation with systems acquisition.

HOW? MANPRINT AOs must ensure that MANPRINT is embedded in WRAP planning and execution. ACTD Concept Documents are to be staffed with MANPRINT. HQDA, G-1 is on the ACTD Candidate Development Team to represent MANPRINT and is a member of the WRAP Army System Acquisition Review Council (ASARC). Recognizing that successful system demonstration will probably lead to accelerated acquisition, MANPRINT considerations must be addressed early in the demonstration planning. This needs to be a coordinated effort of all relevant MANPRINT domains.

# 5.1.12 Review <u>DoDI 5000.2</u>, Enclosure 3, Statutory, Regulatory, and Contract Reporting Information and Milestone Requirements

WHY? This provides you a list of the requirements and program documentation that are necessary to accomplish system development.

HOW? You may access this document on the web or download it by double clicking the underlined DoDI 5000.2 above.

# 5.1.13 Assist in Development of the System Training

WHY? Training is one of the key elements in the successful fielding of a system. The MANPRINT AO can also find assistance for Army Training at the <u>Automated Systems</u>

Approach to Training (ASAT). The STRAP is the master training plan for materiel systems. It:

- Documents the results of early training analyses and training design.
- Starts the planning process for necessary courses and course revisions, training products, and training support required for the system.
- Sets milestones to ensure development of training and training support to permit testing and fielding of a total system.
- Communicates training requirements to schools and centers, HQ TRADOC, MATDEVs, user major commands (MACOMs), and HQDA and Simulation Training and Instrumentation Command (STRICOM) for Training Aids Devices Simulators and Simulations (TADSS).
- Establishes the basis to assess training support progress in support of Requirements Review Committee (RRC) actions, ILS reviews, Training Test Support Package (TTSP), IPRs, and MDR.
- It is a required enclosure to the CDD coordination package.

HOW? MANPRINT AOs must coordinate with the TRADOC proponent school(s) training developer to ensure training development including embedded training considers MANPRINT aspects of system performance, the target population, and MANPRINT thresholds. It is important to remember that the MANPRINT AO may have to coordinate with multiple

TRADOC proponent schools when a FoS or SoS in being developed. Training can be impacted upon by a SoS fielding plan. This means that multiple systems fielding and training will be taking place at a particular location over an elongated period of time. In addition, the MANPRINT AO should:

- Ensure TNGDEVs are included in MANPRINT IPTs.
- Ensure that the TNGDEV has access to the results of any relevant MANPRINT studies or analyses that have been conducted. Results of Early Comparability Analysis (<u>ECA</u>) and Improved Performance Research Integration Tool (<u>IMPRINT</u>) would provide invaluable information.
- Ensure procedures are in place to provide training should embedded training not be available at system fielding.
- Ensure they share information that would be useful for input to a MANPRINT assessment.
- Provide any possible assistance/advice in development of the STRAP.
- Review the draft STRAP and provide any appropriate comments.
- Ensure adequate time is allocated to each system in a SoS environment. Also consider interoperability training.
- For Reserve Forces, ensure training is feasible with respect to drills vs. training time.
- For Reserve Forces, examine the materiel fielding plan to determine when Reserve soldiers are slated to receive new systems. If fielding is not slated to occur within a reasonable time, embedded training will not be a viable training strategy for Reserve Forces.

(Refer to <u>AR 350-1</u> for Army Training and Education and STRAP requirements at <u>TRADOC</u> <u>Reg 350-70</u> for detailed guidance on content and format.)

# 5.1.14 Life Cycle Cost Estimates

WHY? DoD requires the MATDEV/PM to prepare a life cycle cost estimate to assist in making informed decisions regarding the program. The estimate is part of the package for MS B, C, and FRPDR. The life-cycle cost estimates shall be:

- Explicitly based on the program objectives, operational requirements, contract specifications for the system and a DoD Work Breakdown Structure (WBS) for ACAT I and life-cycle cost and benefit element structure of ACAT IA;
- Comprehensive in character, identifying all elements of cost that would be entailed by a decision to proceed with development, production, and operation of the system regardless of funding source or management control;
- For ACAT I programs, consistent with the cost estimates used in the analysis of alternatives, the manpower estimates behind the operation and support costs shall be consistent with the manpower estimate, and
- Neither optimistic nor pessimistic, but based on a careful assessment of risks and reflecting a realistic approach of the level of cost most likely to be realized.

HOW? The MANPRINT AOs should ensure that results of MANPRINT analyses are available for development of lifecycle cost estimates. When possible, review developed lifecycle cost estimates to ensure MANPRINT impacts on the total system are included.

For most systems, the bulk of operation and support costs will be MANPRINT related. This will also be an opportunity to address MANPRINT related cost savings/avoidance, especially in documenting benefits. The IMPRINT tool provides excellent assistance for estimating MPT costs.

# 5.1.15 Continuity of Operations Plan (COOP)

WHY? This plan applies to AIS and command & control systems and ensures continuity of operations in case of a major system failure. Potentially such a failure could have significant implications.

HOW? The MANPRINT AO should coordinate with the COOP POC to ensure MANPRINT implications are included in the COOP and in turn, MANPRINT issues identified in the COOP are addressed where appropriate. It is conceivable that a major system failure could have immediate manpower and personnel impacts. If training does not already address such a contingency, there may also be significant training requirements. Review of the draft COOP should ensure MANPRINT risks are identified. (Additional information on the COOP is contained in AR 25-1.)

# 5.1.16 Develop/Review MANPRINT Domain/MANPRINT Assessment (MA) for Milestone Decision Reviews (MDRs)

WHY? The MA is an independent review of the MANPRINT status of the system. The objective is to present any unresolved MANPRINT risks to PMs and acquisition executive at MDRs so that informed decisions regarding milestone approval can be made.

HOW? Assist the PM in initiating the MA process by informing him of his responsibilities to contact the ARL-HRED lead integrator responsible for the system, as well as, task the domains for the domain assessments. The PM may have to provide some funding for several of the domain assessments. ARL-HRED is responsible for preparing the draft assessment. To do this, they integrate the assessments prepared by each of the seven MANPRINT Domains. Recommend establishing a plan that executes the request for an MA six to nine months prior to the time that the PM needs the MA for the system milestone decision package.

# 5.2 Activities Occurring Prior to the Concept Decision Point of the Concept Refinement Phase

# 5.2.1 Attend System Integrated Capability Development Team (ICDT) and Initiate Development of a Draft MANPRINT Plan

WHY? ICDTs are extremely important because they begin the initial process of capturing requirements. MANPRINT issues and requirements should be addressed and monitored in the

ICDTs products and documents. Use this opportunity to plan a strategy for MANPRINT requirements into system development, identify risks and issues.

HOW? Coordinate with the ARL-HRED MANPRINT Lead for the system to participate in and attend system ICDTs to identify all MANPRINT risks, issues and requirements. Review any of the predecessor system Lessons Learned, Front End Analysis (FEA), DTLOMS/DOTMLPF analyses for MANPRINT risks (if available). Begin development of a draft TAD from the predecessor system as a point of reference. Coordinate and work with CBTDEV to initiate development of a draft MANPRINT Plan to manage the system's MANPRINT processes. Contact the MANPRINT Domains, coordinate with the ARL-HRED system lead, and identify and prepare a POC list to support the MANPRINT ICDT/WIPT process. See Chapter 4 AR 602-2, or Chapter 4, paragraph 4.2 of this publication for more information. The MANPRINT AO may need to update the format for the new acquisition phases.

#### 5.2.2 General MANPRINT Focus Prior To MS A

Prior to the Concept Decision Point of the Concept Refinement Phase and MS A, the major focus of MANPRINT at this earliest stage is to get the MANPRINT program initiated, ensure MANPRINT is adequately represented on ICTs, and to identify MANPRINT needs and constraints. TRADOC Pam 71-20 provides an excellent roadmap of activities that take place during the Pre-Concept Decision Point and Concept Refinement Phase of the acquisition process. MANPRINT is clearly identified as one of the primary participants.

#### 5.2.3 MANPRINT Activities

#### 5.2.3.1 Participate in Integrated Concept Team (ICT) (Warfighting Concepts)

#### 5.2.3.2 Participate in the Functional Solution Analysis (FSA)

WHY? As part of the JCIDS process, the FSA addresses whether DOTMLPF will meet the identified need. The analysis may provide rationale as to why those non-material options are inadequate, infeasible, or undesirable, and thereby support rationale for a material requirement. This, along with the AoA and the TDS, provide the basis for the ICD that identifies the need for a material solution.

HOW? The MANPRINT analyses or tools, such as ECA and IMPRINT, can provide valuable data. The ECA will identify problem tasks on the current system(s) and possible solutions. IMPRINT uses current system information to develop early system performance estimations, and manpower, personnel, and training constraints. MANPRINT experts can facilitate the use of these tools, where appropriate, to support the JCIDS process. MANPRINT AOs should also ensure the AoA consider MANPRINT impacts on cost, schedule, and performance pertaining to each of the alternatives. Often with non-major systems (ACAT III), there is often a short suspense between when an ICT is formed and when requirements documents are desired which precludes the timely and desired application of formal MANPRINT tools. In such cases, there is no effective substitute for an on-site MANPRINT Subject Matter Expert (SME) who maintains frequent interactions with actual or potential customers and (evolving) programs.

# 5.2.3.3 Develop MANPRINT Shortfalls, Constraints, and Requirements for Inclusion in the Initial Capabilities Document (ICD)

WHY? The ICD (see CJCSM 3170.01A, Appendix D) summarizes the results of DOTMLPF (impacts and constraints) analysis and identifies any changes in U.S. or allied doctrine, operational concepts, tactics, organization and training that were considered in satisfying the deficiency. The ICD will also describe why such non-materiel changes have been judged to be inadequate in addressing the complete capability gap. The ICD defines the capability gap in terms of the functional area(s), the relevant range of military operations, the timeframe under consideration, as well as, required attributes with appropriate measures of effectiveness (e.g., time, distance, effect, and obstacles to be overcome). The ICD also captures the evaluation of different materiel approaches that were proposed to provide the required capability. The ICD describes the best materiel approach(es) based on analysis of the relative cost, efficacy, performance, technology maturity, delivery time, and risk. Any known MANPRINT constraints should be stated in the ICD at the outset of the program.

HOW? Working as a member of the ICDT, the MANPRINT AO and the ARL-HRED MANPRINT Lead for the system can provide a valuable service in development of the ICD. MANPRINT implications and constraints can be determined through DOTMLPF analyses, ECA and/or IMPRINT analyses. See <a href="CJCSM 3170.01A">CJCSM 3170.01A</a>, Enclosure D, Appendix A.

MANPRINT experts, working with CBTDEV/TNGDEV, and personnel proponent representatives on the ICT should develop clear, supportable MPT constraints.- Constraints on MPT may have already been identified by HQDA or other Headquarters. These constraints provide the basis for MPT objectives and thresholds developed for the CDD and CPD.

# 5.2.3.4 Initiate Tracking of MANPRINT Risks and Concerns

WHY? Potential MANPRINT risks identified through analyses and/or reasoned logic for pre-Concept Refinement Phase, Concept Refinement Phase, and pre-MS A should be addressed when alternative solutions are examined. Potential risks and concerns may also be found in the MANPRINT Domain Overview of Risks and Concerns at Appendix K through O of this handbook.

HOW? The MANPRINT risk tracking system developed and used by the ARL-HRED MANPRINT Lead for the system, can be initiated and include these preliminary (potential) MANPRINT issues. These risks may ultimately be addressed in the CDD (entrance into the Technology Development Phase). It is within program documents that we will ensure continuity as the program passes from the CBTDEV to the MATDEV.

# 5.3 Activities Occurring During the Concept Refinement Phase to Achieve a MS A Decision

# 5.3.1 General MANPRINT Focus in the Concept Refinement Phase

Entry into this Phase occurs after successful approval of the Concept Decision and prior to MS A. During this phase, an ICD and AoA guide the Concept Refinement. This Phase is to refine the initial concepts and develop the TDS. Working groups are formed to consider risks associated with new concepts, technology and needs. COTS functionality will also be included. There is a need to develop a test plan to ensure the goals and exit criteria for the first technology spiral demonstration are met. Other areas that MANPRINT concerns include: program strategy, cost, schedule, and performance goals. The MANPRINT AO should also focus on drafting KPPs for inclusion in the development of the draft CDD. If MANPRINT is not adequately addressed in the CDD, it will probably not be adequately addressed in contractual and test/evaluation documents or the CPD for the SDD Phase.

The MANPRINT focus during the Concept Refinement Phase is to ensure the AoA and the development of performance parameters for both thresholds and objectives adequately address MANPRINT and soldier implications. The ICD and AoA serve as the lead documents for that purpose. MANPRINT representative(s) should participate in DOTMLPF Analysis and JCIDS process ICDTs/IPTs, and then support the CBTDEV, MATDEV/PM in development of the initial RFP.

# 5.3.2 Provide MANPRINT Requirements Input for Market Research

WHY? DoD acquisition policy dictates that commercial and non-developmental items are to be the primary source of new materiel. NDI/COTS items can be acquired, with little development cost to the Government. These items also permit the Government to keep abreast of the latest in emerging technologies. Nevertheless, the target audience and operating environments for which they are being acquired may be vastly different from those for which the systems were developed.

The MPT constraints (identified in the ICD) are applicable, regardless of acquisition strategy and must be considered when conducting market research.

HOW? The ICD identifies capability gaps, joint DOTMLPF impacts and constraints, and schedule and program affordability for the system(s). MANPRINT, particularly MPT, should be included as part of the DOTMLPF impacts and constraints. MANPRINT experts must ensure these factors are considered by the MATDEV and TRAC, respectively, in conducting market research and the AoA. The Army will ultimately acquire a total system, not just a hardware/software system. The human component and operational environment are key to the operational effectiveness of the total system, so the hardware and software components must be compatible with those elements. Total system performance includes the human element. This is also the time to address any other MANPRINT issues such as human factors engineering, system safety, health hazards, and soldier survivability. This is also a good opportunity to review the MANPRINT Domain Overviews of Risks and Concerns at:

Appendix K MPT Domain Overview of Risks and Concerns

Appendix L Human Factors Engineering (HFE) Overview of Risks and Concerns

Appendix M System Safety (SS) Domain Overview of Risks and Concerns

Appendix N Health Hazards (HH) Domain Overview of Risks and Concerns

Appendix O Soldier Survivability (SSv) Overview of Risks and Concerns

# 5.3.3 Provide Input for Requirements Trade-Off Analyses

WHY? The Requirements Trade-off Analyses are conducted by the CBTDEV (or TNGDEV for training devices). Usually they are sensitivity, uncertainty, or risk analyses, at either the system level or force level, done to determine the impact of alternative system designs and cost variables. They further develop required capabilities and KPPs used in the CDD and later the CPD. KPPs (generally eight or fewer) capture the minimum operational effectiveness and suitability attributes needed to achieve the overall desired capabilities for the system(s) during the applicable increment. KPPs may address manpower, personnel, and training constraints and identify system performance and cost thresholds. There is no set format or scope.

HOW? MANPRINT experts should be available to advise the CBTDEV or TNGDEV on MPT constraints, how they were developed, MANPRINT tools already applied or available, and what support the MANPRINT community can provide.

# 5.3.4 Provide Input for System Concept Studies

WHY? System Concept Studies are conducted by the MATDEV. This analysis identifies the range of materiel possibilities from which to select system characteristics that best solve the operational requirement within given cost and program schedule constraints.

It establishes bands of performance and relationships between factors. It influences the CPD/CDD through interaction with the combat or training developer's requirements trade-off analyses.

HOW? MANPRINT experts should be available to advise the MATDEV on how MANPRINT constraints impact system characteristics. Bands of performance must consider the human as part of the system. Where resources to conduct MANPRINT analyses are an issue, the MATDEV may be able to fund selected efforts as part of this process.

# 5.3.5 Provide Input to the Analysis of Alternatives (AoA)

WHY? The AoA is an independent analysis check that primarily determines operational effectiveness and costs of all alternatives. The analysis considers DOTMLPF impacts. Hence, the AoA must consider MANPRINT impacts on cost, schedule, and performance pertaining to each of the alternatives. It identifies opportunities for trade-offs between performances, costs, and

schedules. The analysis agency develops study issues, alternatives, system performance data, cost data, and MOP and MOE. The HQDA (G-3) tasks TRADOC to conduct AoAs for ACAT I and II programs. HQ TRADOC then normally tasks TRAC to conduct the analysis.

HOW? MANPRINT experts should ensure that the analysis agency has access to the results of any relevant MANPRINT analyses and other MANPRINT information or data that may be useful in the conduct of the AoA. Points of contact should be established for MANPRINT experts and the analytical agency to share information and address issues.

Where the analytical agency has received MANPRINT-related data from other agencies, MANPRINT experts should be available to review the data and identify discrepancies. MANPRINT AOs should, wherever possible, place comments in the intended users' language in terms of content and format.

# 5.3.6 Develop MANPRINT Requirements/Thresholds/Objectives for Inclusion in the Draft Capability Development Document (CDD)

WHY? During the Concept Refinement Phase the draft CDD will probably be initiated. The MANPRINT AO must ensure attendance at any CDD meetings. During Technology Development, the user shall prepare the CDD to support program initiation, refine the integrated architecture, and clarify how the program will lead to joint warfighting capability. The CDD builds on the ICD, AoA, and TDS and provides the detailed operational performance parameters necessary to design the proposed system. The MANPRINT representative(s) should be members of the DOTMLPF Determination Analysis ICT and subsequently the Materiel Requirements Document ICT. These ICTs will identify performance parameters (and in turn, KPPs), MANPRINT thresholds/objectives, maintenance concept, and many other elements ultimately to be embedded in the CDD. The requirements placed in the CDD provide the foundation for subsequent development of RFPs and testing plans. The importance of embedding MANPRINT requirements in these documents cannot be overemphasized.

HOW? The development of MANPRINT-related performance parameters, objectives, and thresholds should be the primary MANPRINT effort. It will probably determine MANPRINT success or failure for the system. While MANPRINT potentially could be embedded throughout the acquisition process as the CDD and later the CPD, early identification of needs is most cost effective and more likely to be succeed. The DOTMLPF analyses are the key components on which to focus.

# 5.3.7 Participate in Development of Test Plan for the First Technology Spiral Demonstration

WHY? It is important that any MANPRINT KPPs or potential risks be evaluated as early in system development as possible. The impact could be in terms of availability of manpower to operate, maintain or repair the system; tasks too difficult to perform based on the capability of the target audience; embedded training, safety, health hazards, or survivability risks. All these MANPRINT factors have a negative impact on cost and performance. You may need to ensure that some of these MANPRINT KPPs are transitioned to the CDD.

HOW? Attend all system ICDTs, call a MANPRINT WIPT, participate in T&E WIPTs, and ensure that minutes and action items are taken of the meetings. Provide updates of the MANPRINT information to the members of the MANPRINT WIPT.

### 5.3.8 Participate in Technology Development Strategy (TDS)

WHY? The technology that is developed for the system may have a direct impact on the members of the target audience. The considerations here are for both physical and mental characteristics of the system operators, maintainers and repairers. There is a possibility that any technology changes to the system could impact the MOSs in the TAD, as well as, the training strategy. The acquisition of systems no longer revolves around the single stovepipe approach. Acquisition today revolves around the procurement of FoS or SoS. The MANPRINT AO must continuously strive to keep the TAD updated. To compound this, the Enlisted MOS structure is constantly changing.

HOW? Ensure that you are a participant in any meetings concerning the TDS, and keep a close watch on manpower to ensure it does not increase. Anytime that there may be a change in an MOS to support the technology under consideration for system development you will need to ensure that the correct functional proponent is identified and notified of the change. Also, keep a close watch on training and include the TNGDEV in relevant meetings. The MOS proponents are at TRADOC Schools and latest MOS updates are at the HRC Smartbook. The HRC Smartbook is on a secure web site. If the link does not work copy this address: <a href="https://perscomnd04.army.mil/MOSMARTBK.nsf/">https://perscomnd04.army.mil/MOSMARTBK.nsf/</a> to your web browser and select "Go."

# 5.3.9 Provide MANPRINT Inputs to Requests For Proposal (RFPs)

**WHY?** The RFP is where the "rubber meets the road." MANPRINT requirements, as well as, risks must be addressed in the RFP to ensure that contractors embrace the MANPRINT concept and develop a total system.

The CBTDEV and MATDEV (or TNGDEV and MATDEV for Non-System Training Device [NSTD]) will conduct a CDD to RFP crosswalk to verify that the RFP (to include system specification or purchase description, and the Statement of Work [SOW]) accurately reflect all requirements in the approved CDD. This process will be documented and include thresholds and objective values of CDD requirements and identify which CDD requirements are KPPs. Differences between CDD and RFP must be documented. When the crosswalk indicates that the RFP does not accurately reflect the approved CDD, the MATDEV is expected to modify the RFP to reflect the CDD. Even after a "preferred solution" is selected/designated, the PM may continue the competitive process. There could be competition for technology demonstrations, in the form of competitive prototyping (fly-offs). The process was, and still is, very flexible. A rolling down-select could end prior to or at program initiation, at the Design Readiness Review (DRR), at MS C, or at any other point the PM decides is appropriate considering the unique characteristics of the program (technology, risk, affordability, and of course programmatic direction from the MDA, the White House, and the Congress.) Of course, the Federal Acquisition Regulation (FAR) exceptions for a sole source environment still exist. In this example, "the system developer" is the acquisition command or the program office. (Obtain

information from the FAR at:

http://deskbook.dau.mil/servlet/ActionController?screen=Policies&Organization=3

HOW? The CBTDEV/MATDEV is the lead for developing input to the RFP. The MANPRINT AO should assist the MATDEV by recommending MANPRINT input to the RFP and by reviewing the draft RFP prior to dissemination. While Military Standards (MIL-STD) and Military Specifications (MIL-SPEC) normally cannot be required, there are exceptions and they may be useful as guidelines. A TAD development process can be found at Appendix J. A copy of the system TAD should be provided to potential contractors (and certainly to contract awardees). Other recommendations include:

- Solicitations shall require offerors to respond to all pertinent MANPRINT considerations in the SOW.
- General MANPRINT program requirements.
- Requirements for total system operational performance with target audience soldiers.
- Domain-specific requirements.
- A Contractor's MANPRINT Plan.
- MANPRINT-related tests and evaluations.
- MANPRINT in program reviews.
- Detailed descriptions of required MANPRINT data and reports.
- Coordinate data requirements with the ILS manager. Refer to Data Item Descriptions (DIDs) for assistance in describing technical data requirements. (A complete list of DIDs can be found in the Acquisition Management Systems and Data Requirements List [AMSDL]). Order delivery of required technical data by including MANPRINT in the Contract Data Requirements List (CDRL). Order only the data required to manage the contractor's effort. Much of the information needed to assess the contractor MANPRINT program will be available through the IPT process.
- Provide for inclusion of the contractor's MANPRINT-related labor in the WBS.
- Provide MANPRINT inputs to the System Specification (Section 2, "Applicable Documents" and Section 3, "Requirements").
- Require MANPRINT be a major criteria in source selection.
  - Para 3.2.1: Total System Performance Characteristics
    Para 3.2.2: Physical Characteristics
    Para 3.3.6: Safety
    Para 3.3.7: Human Factors Engineering Program
    Para 3.3.8: Soldier Survivability
    Para 3.3.9: Health Hazards
  - Para 3.6: Manpower, Personnel, and Training
- Include a MANPRINT paragraph in the Instructions to Offerors (Section L). The contractor should demonstrate:
  - How the MANPRINT program will be implemented
  - Offerors MANPRINT organization and its approach to MANPRINT domain integration

- Approach to identifying MANPRINT risks in system development and engineering
- Plans for ensuring MANPRINT participation in system design efforts
- How to address training and develop an integrated system training plan
- Plans for integrating MANPRINT into contractor's test and evaluation
- Approach to coordinating and integrating MANPRINT with ILS activities
- Develop recommendations for the evaluation criteria for MANPRINT, to be included in Section M of the RFP. Additionally, prepare a recommended statement on the relative importance of MANPRINT for inclusion in the Executive Summary.
- Assist MANPRINT SMEs on the Source Selection Evaluation Board (SSEB), as required/requested.

# 5.3.10 Schedule a MANPRINT Integrated Capability Development Team (ICDT)/Integrated Product Team (IPT)

WHY? The ICDT is intended to be used to establish desired capabilities of the system. The IPTs are for program development and execution. This ICDT/IPT could be the foundation for assessing the status of any MANPRINT Domain Risk and risk-tracking log. This is important because it provides an updated list of risks as the system progresses toward MS A. With any change in technology, there is also the chance that safety, soldier survivability, health hazards, and human factors may have been negatively impacted upon. Recommend scheduling the MANPRINT ICDT/IPT early in the Concept Refinement phase and prior to MS A.

HOW? Coordinate with the ARL-HRED MANPRINT System Lead, CBTDEV/FP and request that a MANPRINT ICDT/IPT be scheduled. Invite all the MANPRINT Domain Agency POCs for the system. Present the draft MANPRINT Plan and draft TAD. Review and update all MANPRINT risks, opportunities, and requirements. It also provides an opportunity to review any of the DOTMLPF analyses for MANPRINT risks. Changes in the technology approaches often impact the system TAD. Use this opportunity to update the TAD. With any change in technology, there is also the chance that safety, soldier survivability, health hazards, manpower, training, and human factors engineering have been impacted. Update the MANPRINT Plan as necessary. Below are links to appendices to assist the MANPRINT AO

Appendix J Target Audience Description (TAD)

Appendix K MPT Domain Overview of Risks and Concerns

Appendix L Human Factors Engineering (HFE) Overview of Risks and Concerns

Appendix M System Safety (SS) Domain Overview of Risks and Concerns

Appendix N Health Hazards (HH) Domain Overview of Risks and Concerns

Appendix O Soldier Survivability (SSv) Overview of Risks and Concerns

#### 5.3.11 Participate in Development of System Training

WHY? The STRAP is the master training plan for materiel systems. It documents the results of early training analyses (e.g., who requires training and what tasks are to be trained) and training design (e.g. where and how the Army will conduct training, including identification of TADSS and embedded training requirements). The STRAP starts the planning process for necessary courses and course revisions, training products, and training support required for the system. It sets milestones to ensure development of training and training support to permit testing and fielding of a total system. It establishes the basis to assess training support progress in support of Army Requirements Oversight Council (AROC) and Joint Requirements Oversight Council (JROC) actions, Logistical Support reviews, IPRs, ICDT, IPT reviews, and MDR. Development of the STRAP is a requirement of DoDI 5000.2, Enclosure E7, paragraph E7.6 and TRADOC Reg 350-70. TRADOC Reg 350-70 also contains all the requirements and a STRAP format. The MANPRINT AO must also be concerned with ensuring that TADSS are considered in the training process. Additional IPTs and TADSS may be required. Coordinate closely with the system TNGDEV.

HOW? Participate in any ICDTs, IPTs, Supportability IPTs, etc. This will also have impact on the CDD and later the CPD. By participating in Training meetings, the MANPRINT AO ensures that MANPRINT requirements and concerns are identified and embedded in the STRAP. MANPRINT AOs must ensure training development considers MANPRINT aspects of system performance, the TAD, and MANPRINT thresholds.

# 5.3.12 User Functional Description (UFD)

WHY? The UFD is a document prepared as a follow-up to the CDD to specifically address requirements related to IT. It is prepared by the CBTDEV when needed based on anticipated degree to which the system will use IT. It provides general information, system summary, detailed characteristics, operational mode summary/mission profile, external environments, security, system development, and domain impacts.

HOW? MANPRINT AOs should participate in the development of the UFD, or as a minimum, the review. The results of MANPRINT analyses that provided input to the CDD may also provide human factors engineering, training, or other MANPRINT constraints for the UFD. Functional requirements should address man-machine interface issues. Security requirements may have an impact on personnel requirements of user and/or maintainer occupational specialties. Domain impacts specifically address MANPRINT-related system characteristics and issues. MANPRINT thresholds contained in the CDD must be crosswalked to this section of the UFD.

# 5.3.13 Assist the CBTDEV/FP (PM after MS B) in Developing the Economic Analysis (EA) for Major Automated Information System (MAIS) Only

WHY? The EA is an analysis of cost of the operation and support of the AIS and may be combined with the AoA at MS A (<u>DoDI 5000.2</u> Enclosure 3). The EA is required for MS A, B, and the Full-Rate Production Decision Review (FRPDR) or equivalent.

#### HOW?

- Review the report requirements to determine where MANPRINT inputs should be included (e.g., product quality, manpower, training and supportability).
- Review all the MANPRINT-related documentation.

# 5.4 Activities Occurring During the Technology Development Phase to Achieve a MS B Decision

This phase is to reduce technology risks and determine which technologies are to be integrated into a full system. The system will have achieved MS A approval at this point. There is an approved ICD, TDS and Test Strategy.

# 5.4.1 Participate in the Development of Capability Development Document (CDD)

WHY? The development of the CDD is guided by the ICD, the AoA, and the TDS. The CDD provides the operational performance parameters, including KPPs, which are necessary for the acquisition community to design a proposed system and establish a program baseline. A minimal set of KPPs must be approved for the system for entrance criteria into the SDD Phase. This is a key focal point for the MANPRINT AO, the ARL-HRED MANPRINT System Lead, and representatives from the MANPRINT Domains. This is where the hard work and analyses payoff. If the MANPRINT KPPs are not included here, the chances of getting them into the CPD will prove difficult.

HOW? Ensure that you are invited to participate in all meetings for development of the CDD. Maintain close contact and coordinate with all your MANPRINT Domain POCs. Provide feedback on the results of all CDD IPTs to the members of the MANPRINT Domain Agencies. The format requirements for the CDD are found in <a href="CJCSM 3170.01">CJCSM 3170.01</a>, Appendix A, Enclosure E.

# 5.4.2 Schedule A MANPRINT Integrated Concept Team (ICT)/Integrate Product Team (IPT)

WHY? MS A has been approved at this point. This is a good opportunity to assess the status of any MANPRINT Domain risks. Coordinate with the CBTDEV/FP and recommend that a MANPRINT ICT/IPT be held. This is important because it will provide an updated list of risks as the system progresses toward MS B. With any change in technology, there is also the chance that safety, soldier survivability, health hazards, manpower, training, and human factors engineering have been impacted. Use this opportunity to provide MANPRINT input to the RFP and the SOW. For additional RFP information concerning the RFP please see Chapter 7. Also,

recommend that a MANPRINT ICT/IPT be scheduled prior to the MS B Decision Review and request that a MA be completed.

HOW? Review and update all MANPRINT risks. This provides an opportunity to review any of the DOTMLPF analyses for MANPRINT issues. Changes in the technology approaches often impact the system TAD. Use this opportunity to update the TAD. With any change in technology, there is also the chance that safety, soldier survivability, health hazards, manpower, training and human factors engineering may have been impacted. Be sure to update the MANPRINT Plan.

# 5.4.3 Participate in Development of Draft Test and Evaluation Master Plan (TEMP) Integrated Working Group (T&E WIPT)

WHY? This is an opportunity to ensure MANPRINT KPPs are tested as part of the system evaluation. Ensure that MANPRINT KPPs and risks are evaluated in the perceived (real-life) operational scenario (i.e., operational mode summary/mission profile). There may be difficult tasks, health, or safety risks that need to be evaluated. It also provides the opportunity to ensure that members of the target audience participate in evaluation process.

HOW? Coordinate with the T&E lead to ensure that you are included in any system testing meetings. There will be T&E WIPTs upon MS B approval and appointment of the PM. Provide members of the MANPRINT ICT/IPT copies of minutes from the meetings.

# 5.4.4 Provide Assistance in the Development of the Manpower Estimate (ME)

WHY? The ME is required for ACAT I programs at MS B, C, and FRPDR (<u>DoDI 5000.2</u>, Enclosure 3). The MANPRINT AO has access to the system target audience information, the predecessor system TAD, system analyses, and the system functional proponent(s). Gathering as much accurate manpower information early in system development assists in providing the most affordable solutions. If this is a FoS or SoS, the manpower requirements will normally impact multiple system proponents.

HOW? Provide the person responsible for the ME access to the TAD, any available TOE from the predecessor system, POC list for U.S. Army Force Management Support Activity (USAFMSA), any projected MOS billpayers, and ask whether the new system is a FoS or SoS. Also visit the USAFMSA web site.

# 5.4.5 Participate in the Development of the Cost Benefit Analysis and Determination

WHY? The Cost Benefit Analysis assists in looking at the return of investment in terms of dollars. The Cost Benefit Analysis and Determination are statutory requirements for both Major Defense Acquisition Programs (MDAPs) and MAIS acquisition programs. It is required at MS B or C (if a program has no MS B) (DoDI 5000.2 Enclosure 3).

HOW? Assist the CBTDEV/FP (PM after MS B) in development of the Cost Benefit Analysis and Determination.

- Review the report requirements to determine where MANPRINT inputs should be included (e.g., product quality, manpower, training and supportability).
- Review all the MANPRINT-related documentation.

# 5.5 Activities Occurring During the System Development and Demonstration (SDD) Phase to Achieve a MS C Decision

In this phase the PM is assigned and the system is developed and demonstrated. The main purpose of this phase is to reduce integration and manufacturing risks and ensure operational supportability. The implementation of MANPRINT/HSI receives heavy emphasis. Also, there is an approved CDD at this point.

# 5.5.1 Schedule a MANPRINT WIPT and Prepare The MANPRINT WIPT Charter

WHY? MS B has been approved at this point and a PM is appointed. Coordinate with the ARL- HRED MANPRINT Lead for the system and have a meeting with the PM to assess and provide the status of any MANPRINT Domain risks. Recommend to the PM that a MANPRINT WIPT Charter be prepared. The primary purpose of the (system name) MANPRINT/HSI or Supportability WIPT is to provide for the comprehensive management and technical effort necessary to assure total system effectiveness. This is important because it will provide an updated list of risks as the system progresses toward MS C. With any change in technology there is also the chance that safety, soldier survivability, health hazards, and human factors engineering may have been negatively impacted. Also, recommend scheduling a MANPRINT WIPT prior to MS C.

HOW? Prepare the MANPRINT WIPT Charter. A sample format, which can be modified to suit the acquisition system, is at Appendix E. Identify all MANPRINT risks, Logistical Supportability risks, and opportunities to the PM. At this point you may want to begin using a risk-tracking sheet. There is a sample risk-tracking format at Appendix G. Review and update all MANPRINT risks. Review the TEMP, ME, Cost Benefit Analysis, Programmatic Environment Safety and Occupational Health Evaluation (PESHE), TDS, ICD and CDD for MANPRINT issues and KPPs that must be included in the draft CPD. There will probably be adjustments to the TAD at this point. Use this opportunity to update the TAD. Midway through this phase you will have a DRR. Use this IPT to assist in preparation for that decision point. Remember to update the MANPRINT Plan. There is also a distinct possibility that a MANPRINT Assessment may be necessary to support the DRR. If a MANPRINT Assessment for the DRR is required, remind the PM to request it in a timely manner prior to the DRR.

# 5.5.2 Participate in the Capability Production Documents (CPD) Development

WHY? The CPD (CJCSM 3170.01, Enclosure F) addresses the production attributes and quantities specific to a single increment of an acquisition program. Performance and supportability attributes in the CPD are specific. The threshold and objective performance values of the CDD are superseded by the specific production values detailed in the CPD. The CPD must be validated and approved before the MS C decision review.

HOW? Ensure, by active participation in the CPD IPT, that MANPRINT requirements or KPPs are refined and embedded in the CPD. This is one of the most important documents that is used to develop the system. MANPRINT requirements or KPPs must be included in this document to ensure that the human element is considered in system design, test, and evaluation.

# 5.5.3 Participate in T&E WIPT Meetings

WHY? To assist in writing the TEMP, as well as, to ensure MANPRINT requirements or KPPs in the CDD/CPD are addressed in it. There may be difficult tasks, health, or safety risks that need to be evaluated. This also provides the opportunity to ensure that members of the target audience participate in the test and evaluation process.

HOW? Continued participation in all T&E WIPT. Provide members of the MANPRINT WIPT copies of minutes from the meetings. If possible, observe operational tests, as time permits.

# 5.5.4 Participate in the Development of the Basis of Issue Plan Feeder Data (BOIPFD)

WHY? Basis of Issue Plan (BOIP) is a document that adds a new piece of equipment and/or a new capability to a unit. This is the document that modernizes a unit to improve its capability to accomplish its assigned mission. Every piece of standard equipment in the United States TOE Army has a BOIP. BOIPFD is the beginning of the process to provide information in the development of the BOIP. The MATDEV, PM, and Program Executive Officer (PEO) has responsibility to provide the BOIPFD. The MATDEV, PM and PEO are referred to as the MATDEV in this process. The MANPRINT AO has knowledge of the system, FoS or SoS target audience and MOS requirements and is a value added asset to the BOIPFD process.

HOW? An approved CDD starts the BOIPFD process. Become familiar with AR 71-32 and BOIPFD processes in TRADOC Pam 71-20 and assist the MATDEV as requested.

# 5.5.5 Continue Participation in the System Training Development

WHY? The STRAP is the master training plan for materiel systems; however, any changes that occur in the target audience must be captured in the STRAP. Development of the STRAP is a requirement of Enclosure E7, paragraph E7.6, <u>DoDI 5000.2</u>, and <u>TRADOC Reg 350-70</u> which also contains all the requirements and a STRAP format.

HOW? Participate in any ICDTs, IPTs, Supportability IPTs, etc. This will also have impact on the CDD and the CPD. By participating in the Training Effectiveness Analysis (TEA) IPTs, and STRAP IPT the MANPRINT AO ensures that changes in target audience requirements and concerns are identified and embedded in the STRAP. The TNGDEV should always be kept informed of any changes that impact the STRAP.

#### 5.5.6 Provide MANPRINT Input to the Acquisition Program Baseline (APB)

WHY? Every acquisition program shall establish an APB to document the cost, schedule, and performance objectives and thresholds of that program, starting at program initiation (MS B approval, C as necessary, and FRP). It is prepared by the PM in coordination with the user. It shall contain only the most important parameters (those that, if the thresholds are not met, the MDA would require a reevaluation of alternative concepts or design approaches). KPP values should not differ from like values in the CDD. Schedule parameters should include program initiation, Milestones, First Unit Equipped (FUE), IOC, and other critical system events. Cost parameters would normally not include Operation and Support (O&S) costs unless designated by the MDA.

HOW? The primary role of the MANPRINT AO in development of the APB is to provide the PM necessary support. The PM should be advised on the MANPRINT impacts of KPPs and reinforce the need to acquire a total system. MANPRINT can help get the system developed properly and facilitate test and evaluation, thus precluding rework and rescheduling. MANPRINT can provide significant cost savings/avoidance on Research and Development (R&D)/procurement costs and especially on O&S costs. The MANPRINT AO needs to facilitate the identification of relevant MANPRINT cost data. Other actions might include:

- Review the results of manpower and personnel analyses (e.g., predecessor system manpower requirements, new system manpower requirements prepared for the life cycle cost estimate, the target audience description, lessons-learned).
- Review the results of any available tests, evaluations, and assessments (e.g., early user tests, contractor developmental tests, prototype demonstrations).
- When available, review MANPRINT Domain assessments.
- Consult with MANPRINT WIPT SMEs.
- Coordinate with other individuals preparing input for the APB.
- Consult with the TNGDEV; review the STRAP.

# 5.6 Activities Occurring During the Production and Deployment Phase

In this phase the system is expected to achieve operational capability that meets the mission needs. The system must have acceptable performance, a test and evaluation and operational assessment, and no significant manufacturing risks. There must also be a copy of the approved ICD and the CPD.

#### 5.6.1 Schedule a MANPRINT WIPT

WHY? MS C has been approved at this point. This is a good opportunity to assess the status of any MANPRINT Domain risks. This is important because it will provide an updated list of risks as the system progress toward FRPDR. The LRIP decision and IOT&E occur during this phase. Ensure that the MANPRINT requirements or KPPs have been embedded into test and evaluation plans. This allows the MANPRINT WIPT a final opportunity to review risks that may impact LRIP. Consider a MANPRINT WIPT six to nine months prior to the FRPDR.

HOW? Review and update all MANPRINT risks. Provide a copy of the updated MANPRINT Plan to the testers. Review and crosswalk documents like the Cost Benefits Analysis, EA, STRAP, Acquisition Strategy, TAD, APB, ME, TDS, ICD, CDD and CPD for consistency. There may also be adjustments to the target audience at this point. An important question to answer here is: Are there any new billpayer risks identified? Use this opportunity to update the TAD. Midway through this phase you will have a FRPDR. Use this IPT to assist in preparation for that decision point. There is also a distinct possibility that a MANPRINT Assessment may be necessary to support the FRPDR. Remember, that if you need a MANPRINT Assessment for the FRPDR, plan in advance to ensure a timely tasking and funding, as required, by the Program/Project/Product Manager's Office (PMO) is provided to the MANPRINT Domain Agencies.

# 5.6.2 Coordinate with Testers to Obtain Initial Operational Test and Evaluation (IOT&E) Results

WHY? Feedback from the system testers provides invaluable information to assess the validity of the MANPRINT requirements or KPPs and the ability of the target audience to validate the operation, maintenance and training required.

HOW? Ensure members of the target audience participate in system tests. Talk with members of the target audience and testers on a daily basis to obtain any results of the training. Questions could include the following: How difficult was it to perform tasks? Were difficult tasks designed out of the system? Do any of the system safety or health hazard risks require additional training? Ask to participate as an observer in the system testing. Most importantly, ask for copies of test reports when they have been released to the PM.

# 5.6.3 Participate in all System Training Development

WHY? Once LRIP and IOT&E are underway, new training requirements may be identified that should be reviewed for MANPRINT impacts. The fielding of SoS or FoS may identify new training challenges and impacts that require attention and resolution or may be recorded as lessons learned.

HOW? Always ask for Operational Test Agency reports of Operational Test and Evaluation results. Test results and MANPRINT impacts are extremely important as we move from system fielding to the Operations and Support Phase.

# 5.7 Activities Occurring During the Operations and Support Phase

This phase occurs after system fielding and includes the execution of a support program that meets operational support performance requirements and the sustainment of the system. This includes supply, maintenance, and transportation, sustaining engineering, data management, configuration management, manpower, personnel capabilities, training, survivability, environment, safety, health, security, and soldier survivability.

#### 5.7.1 Document MANPRINT Lessons Learned

WHY? As with any program, MANPRINT must demonstrate value-added, especially in times of austere budgets. The benefits of maintaining a MANPRINT program must exceed the costs. To accomplish this, the benefits of MANPRINT must be captured and to the extent possible, cost savings/avoidance must be quantified. Documenting all MANPRINT Lessons Learned, is very important. The PM is required to work with system users to document performance and support requirements in performance agreements that specify objective outcomes, measure resource commitments, and stakeholder responsibilities. You may need to validate some of the fielded system requirements by asking, "Does the system have embedded training and diagnostics?" Or, "Does the system provide Operational Support and Sustainment for DOTMLPF?

HOW? Be proactive and participate in all post fielding meetings and IPTs. Any and all information should be documented for future reference. This information could prove useful if there are any additional increments to be developed and deployed to the field. Advise the PM of any risks that have been identified (if any). MANPRINT domain representatives should, to the extent possible, identify and quantify MANPRINT benefits, primarily through cost savings or cost avoidance. This can result from fewer accidents, reduced hospitalization, reduced manpower, lower skill requirements, reduced training, or other related efforts accomplished right the first time as a result of MANPRINT, or other quantifiable aspects. Benefits of specific systems can be used to validate and publicize the value-added by early implementation of a strong MANPRINT program.

# 5.7.2 Identify MANPRINT-Related Modifications/Improvements

WHY? Frequently, systems are developed that require substantial modification and/or improvement after initial fielding. These may be pre-planned (planning to take advantage of technological advances not available for initial production) or required as a result of test and evaluation and/or post-fielding analyses. These system changes may have significant MANPRINT-related impacts. In fact, MANPRINT-related risks may be a reason for the modification/improvement.

HOW? MANPRINT tools, such as ECA and IMPRINT, can provide information useful in justifying an unplanned product modification/improvement. Difficult soldier tasks may not have an acceptable manpower, personnel capabilities, or training solution. Human resource requirements may turn out to be excessive and unacceptable. Where there is a P3I, there is a need that has been already identified, but MANPRINT can help clarify and expand on that need. If a system is to be modified or upgraded, it may be best to make all changes at one time rather than piecemeal. System modifications can also impact legacy or programmed TADSS.

#### 5.7.3 Schedule a MANPRINT WIPT

WHY? The system is now at FOC. Post-fielding analyses are beginning to flow back to the PM. There could be valuable training lessons learned from fielding the FoS or SoS that need to be captured. An example might be that there was training overload because there are too many

training classes that a soldier had to attend in a short period of time for multiple systems being fielded to unit. This is a good opportunity to have the members of the MANPRINT WIPT review any new Engineering Change Proposals (ECPs).

HOW? Review and update all MANPRINT risks. Validate the TAD one last time. Verify that the approved BOIP is in place at the time the system/FoS/SoS is fielded. Check to make sure that a copy of the MANPRINT Plan and issues for the system are updated/resolved.

# **CHAPTER 6**

# 6.0 THE MANPRINT ASSESSMENT (MA)

The MA is an independent review of the MANPRINT status of the system. The objective is to present any unresolved MANPRINT risks to the PM and decision makers at MDRs A, B, and C; DRR, if necessary, in the SDD Phase; FRPDR in the Production and Deployment Phase so that informed decisions regarding milestone approval can be made. Establish a plan that executes the request for a MA six to nine months prior to the time that the PM needs the MA for the system milestone decision package. A great deal of coordination is required by the MANPRINT Domain Agencies to prepare the MA to support the milestone decision review. A sample MA is at Appendix H.

#### 6.1 The MANPRINT Domain Assessments

ARL-HRED is responsible for preparing the draft assessment. To do this, they integrate information from numerous sources, described below.

- Manpower, Personnel Capabilities, and Training (MPT) Domain Assessments (<u>AR</u> 602-2): The MPT Assessments, which are prepared by the MPT Domain Branch, DCSOPS, HRC, assess the MPT risks of the system. They identify all positive elements and critical or major risks. They address the impact the system will have on MPT resources by examining a myriad of domain characteristics. The HRC is only resourced to conduct assessments on major systems. ARL-HRED prepares the MPT Domain Assessment on non-major systems, if required.
- Human Factors Engineering Domain (HFE) Assessment (<u>AR 602-1</u>): The HFE Domain Assessment is prepared by ARL-HRED. It reviews the status of human factors engineering as the system approaches a new acquisition phase. A major purpose of the report is to identify any design flaws which, taken singularly or collectively, may be so problematic that, they might warrant a decision against transitioning to the next phase. It will also identify risks that should be resolved to enhance total system performance.
- System Safety (SS) Domain Assessment (<u>AR 385-16</u>): The purpose of the SS Domain Assessment is to assess the overall safety of the emerging or changing system and ensure that system safety risks and recommended solutions are integrated into the acquisition program. For AIS, the assessment is prepared by the AMC. For materiel systems, the assessment is prepared by the U.S. Army Combat Readiness Center. (For non-major materiel systems, the safety assessment is done by a local safety office, AMC, installation.)
- **Health Hazards (HH) Domain Assessment** (<u>AR 40-10</u>): The HH Domain Assessment identifies potential health hazards which may be associated with the development, acquisition, operation, and maintenance of Army systems. The purpose is to preserve and protect personnel who will operate, maintain and support the equipment; enhance total system effectiveness; reduce system retrofit needed to eliminate health hazards; and reduce readiness deficiencies attributable to health hazards. This assessment also looks to reduce personnel compensation claims by eliminating or reducing injury or illness caused

- by HH associated with the use of Army systems. The HHA is prepared by the Center for Health Promotion and Preventive Medicine (CHPPM).
- Soldier Survivability (SSv) Domain Assessment (<u>AR 70-75</u>): The SSv Domain Assessment addresses the system's ability to reduce fratricide; reduce detectability; reduce the probability of being attacked; prevent damage if attacked; minimize injury, and reduce mental and physical fatigue. This assessment is prepared by the Army Research Laboratory Survivability/Lethality Analysis Directorate (ARL-SLAD). (For non-major programs, the survivability assessment is performed by ARL-HRED).

#### 6.2 The MANPRINT Assessment Process

The completed Domain Assessments are collected by ARL-HRED and simultaneously sent to the PM and TSM/CBTDEV. ARL-HRED reviews them, prepares the Draft MA and staffs it with the domains as well as with the PM and TSM/CBTDEV. The Draft Assessment is then sent to the MANPRINT Directorate, Office Deputy Chief of Staff (ODCS), G-1. At this stage, the assessment is still draft and is not official. The MANPRINT Directorate finalizes the MA and the Director of MANPRINT approves and signs it. It is then forwarded through the ASARC Secretary for the ASARC members; to the IT Overarching Integrated Product Team (OIPT); or to the MDA, as appropriate.

The MA presents the ODCS, G-1's formal position on MANPRINT risks. It is for this reason that the ODCS, G-1 and ARL-HRED work closely with the PM and CBTDEV/FP and/or TSM. The PM and FP/CBTDEV and/or TSM thus have an opportunity to correct or address any previously unidentified MANPRINT risks, and to provide input to the assessment process. Critical and major risks, as reflected in the assessment, should be well-known by all at the time the assessment is prepared. A sample MA is at Appendix H. (Refer to Appendix B for definitions of "critical risk" and "major risk.")

# **CHAPTER 7**

#### 7.0 MANPRINT IN THE PROPOSAL AND CONTRACTING PROCESS

# 7.1 The Request for Proposal (RFP)

Information regarding the RFP and contracting processes are located in the FAR and <u>DA Pam 70-3</u>. The MANPRINT AO should assist the MATDEV by recommending MANPRINT input to the RFP by reviewing the draft RFP prior to its dissemination. Obtain information from the FAR at: <a href="http://deskbook.dau.mil/servlet/ActionController?screen=Policies&Organization=3">http://deskbook.dau.mil/servlet/ActionController?screen=Policies&Organization=3</a>

# 7.2 Development of the RFP is a Team Effort

There is an Integrated Product and Process Development (IPPD) that incorporates the functional areas of systems engineering, engineering data and specifications, software engineering, configuration management, product assurance, integrated logistics support and specialty engineering into a single Integrated Program Master Plan (IPMP) and Master Program Schedule (MPS). The system IPPD process addresses MANPRINT/HSI and human engineering design criteria, principles and practices to achieve safe and reliable system performance requirements. The MANPRINT AO should be an active participant of the RFP development Team. The CBTDEV or TNGDEV and the MATDEV will crosswalk the requirements in the CDD/CPD to the RFP. This process will be documented and include thresholds and objective values of CDD/CPD requirements and identify which requirements are KPPs.

The MANPRINT AO should request a CDRL be included for the development of the Manufacturers MANPRINT Management Plan (M3P). The M3P should include what, where, when, and how the contractor/manufacturer is going to accomplish the MANPRINT requirements. This also provides the system PM and the MANPRINT AO feedback as to how the manufacturer implements the MANPRINT requirements as the system is being developed. This process ensures that all involved in the system development know and understand their responsibilities. Most importantly it supports the requirement that the PM must have a comprehensive plan for HSI/MANPRINT in place.

#### Other recommendations include:

- Incorporate MANPRINT requirements into the Statement of Work (SOW):
  - General MANPRINT program requirements
  - Requirements for total system operational performance with target audience soldiers
  - Domain-specific requirements
  - Contractor's plans for accomplishing the MANPRINT/HSI program
  - MANPRINT-related tests and evaluations
  - MANPRINT in program reviews
  - Detailed descriptions of required MANPRINT data and reports
- Provide for inclusion of the contractor's MANPRINT-related labor in the WBS.

- Provide MANPRINT inputs to the System Specification (Section 2, "Applicable Documents" and Section 3, "Requirements").
  - Para 3.2.1: Total System Performance Characteristics
  - Para 3.2.2: Physical Characteristics
  - Para 3.3.6: Safety
  - Para 3.3.7: Human Factors Engineering Program
  - Para 3.3.8: Soldier Survivability
  - Para 3.3.9: Health Hazards
  - Para 3.6: Manpower, Personnel, and Training
- Include a MANPRINT paragraph in the Instructions to Offerors (Section L). The contractor should demonstrate:
  - How the MANPRINT program will be implemented
  - Offeror's MANPRINT organization and its approach to MANPRINT domain integration
  - Approach to identifying MANPRINT risks in system development and engineering
  - Plans for ensuring MANPRINT participation in system design efforts
  - How to address training and develop an integrated system training plan
  - Plans for integrating MANPRINT into contractor's test and evaluation
  - Approach to coordinating and integrating MANPRINT with ILS activities
- Develop recommendations for the on evaluation criteria for MANPRINT, to be included in Section M of the RFP. Additionally, prepare a recommended statement on the relative importance of MANPRINT for inclusion in the Executive Summary.
- Assist MANPRINT SMEs on the SSEB, as required/requested.

# APPENDIX A ACRONYMS

	—A—
AAE	Army Acquisition Executive
ACAT	Acquisition Category
ACR	Advanced Concepts and Requirements
ACTD	Advanced Concept Technology Demonstration
AFQT	Armed Forces Qualification Test
AIS	Automated Information System
AIT	Automatic Identification Technology
AKSS	AT&L Knowledge Sharing System
ALMC	Army Logistic Management College
AMC	Army Materiel Command
AMCOS	Army Manpower Cost System
AMSDL	Acquisition Management Systems and Data Requirements List
AMSO	Army Model and Simulation Office
AO	Action Officer
AoA	Analysis of Alternatives
AOC	Area of Concentration
APB	Acquisition Program Baseline
AR	Army Regulation
ARI	Army Research Institute
ARL	Army Research Laboratory
ARL-HRED	Army Research Laboratory—Human Research and Engineering
	Directorate
ARL-SLAD	Army Research Laboratory—Survivability/Lethality Analysis
	Directorate
AROC	Army Requirements Oversight Council
ASA(ALT)	Assistant Secretary of the Army (Acquisition, Logistics, and
	Technology)
ASARC	Army System Acquisition Review Council
ASAT	Automated Systems Approach to Training
ASI	Additional Skill Identifier
ASIOE	Additional Support Item of Equipment
ASVAB	Armed Services Vocational Aptitude Battery
AT&L	Acquisition, Technology & Logistics
ATD	Advanced Technology Demonstration
ATEC	Army Test and Evaluation Command
AURS	Automated Unit Reference Sheets
AWE	Advanced Warfighting Experiment

	<u>—В</u> —
BCT	Brigade Combat Team
BOIP	Basis of Issue Plan
BOIPFD	Basis of Issue Plan Feeder Data
	—C—
C4I	Command, Control, Communications, Computers and Intelligence
CARD	Consolidated Acquisition Reporting System
CBTDEV	Combat Developer
CDD	Capability Development Document
CDRL	Contract Data Requirements List
CEP	Concept Experimentation Program
CG	Commanding General
СНРРМ	Center for Health Promotion and Preventive Medicine
CJCS	Chairman of the Joint Chiefs of Staff
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CJCSM	Chairman of the Joint Chiefs of Staff Manual
CMF	Career Management Fields
COIC	Critical Operational Issues and Criteria
COMPUSEC	Computer Security
COMSEC	Communications Security
COOP	Continuity of Operations Plan
COR	Contracting Officer Representative
COTS	Commercial Off-The Shelf
CPD	Capability Production Document
CPI	Critical Program Information
CRD	Capstone Requirements Document
CS	Combat Support
CSS	Combat Service Support
	_D_
DA	Department of the Army
DAPE-MR	Office symbol for MANPRINT Directorate
DASAF	Director of Army Safety
DCS	Deputy Chief of Staff
DCSOPS	Deputy Chief of Staff for Operations
DID	Data Item Description
DISC4	Director of Information Systems for Command, Control,
	Communications & Computers
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership and Education,
	Personnel and Facilities
DRR	Design Readiness Review

DT/OT	Development Testing/Operational Testing	
DTP	Detailed Test Plan	
DTRR	Developmental Test Readiness Review	
	— <b>E</b> —	
E3	Electromagnetic Environmental Effects	
EA	Economic Analysis	
ECA	Early Comparability Analysis	
ECP	Engineering Change Proposal	
ELSEC	Electronic Security	
EMSEC	Emissions Security	
EW	Electronic Warfare	
	<b>F</b>	
FAR	Federal Acquisition Regulation	
FEA	Front End Analysis	
FMBB	Force Management Bulletin Board	
FOA	Field Operating Agencies	
FOC	Full Operational Capabilities	
FoS	Family of Systems	
FP	Functional Proponent	
FRP	Full Rate Production	
FRPD	Full-Rate Production & Deployment	
FRPDR	Full Rate Production Decision Review	
FSA	Functional Solution Analysis	
FUE	First Unit Equipped	
	<b>—</b> G—	
GS	General Schedule	
GSA	General Services Administration	
—H—		
HARDMAN	Hardware vs. Manpower	
HCM	HARDMAN Comparability Methodology	
HFE	Human Factors Engineering	
HH	Health Hazards	
HHA	Health Hazard Assessment	
HHAR	Health Hazard Assessment Report	
HQ	Headquarters	
HQDA	Headquarters Department of the Army	
HRC	Human Resources Command	
HSI	Human Systems Integration	

	—I—
ICD	Initial Capabilities Document
ICDT	Integrated Capabilities Development Team
ICT	Integrated Concept Team
IIPT	Integrating Integrated Product Team
ILS	Integrated Logistics Support
ILSM	Integrated Logistics Support Manager
IMA	Information Mission Area
IMPRINT	Improved Performance Research Integration Tool
IO	Information Operations
IOC	Initial Operational Capability
IOT&E	Initial Operational Test and Evaluation
IOVSA	Information Operations Vulnerability Survivability Assessment
IPMP	Integrated Program Master Plan
IPPD	Integrated Product and Process Development
IPR	In-Process Review
IPT	Integrated Product Team
ISS	Information Systems Security
IT	Information Technology
IW	Information Warfare
	—J—
JCIDS	Joint Capabilities Integration and Development System
JROC	Joint Requirements Oversight Council
	— <i>K</i> —
KPP	Key Performance Parameter
KSAO	Knowledge, Skills, Abilities, and Other Characteristics
	<u>—L</u> —
LCC	Life Cycle Cost
LCM	Life Cycle Model
LRIP	Low Rate Initial Production
LSAR	Logistic Support Analysis Record
	<b>—M</b> —
M3P	Manufacturers MANPRINT Management Plan
M&S	Modeling and Simulation
MATDEV	Materiel Developer
MA	MANPRINT Assessment
MACOM	Major Command
MAIS	Major Automated Information System
MAISRC	Major Automated Information Systems Review Council
MANPRINT	Manpower and Personnel Integration
MARC	Manpower Requirements Criteria
MDA	Milestone Decision Authority

MDAP	Major Defense Acquisition Program	
MDR	Milestone Decision Review	
ME	Manpower Estimate	
MIL-SPEC	Military Specification	
MIL-STD	Military Standard	
MIPS	Modified Integrated Program Summary	
MJWG	MANPRINT Joint Working Group	
MOE	Measure of Effectiveness	
MOP	Measure of Performance	
MOPP	Mission-Oriented Protective Posture	
MOS	Military Occupational Specialty	
MPS	Master Program Schedule	
MPT	Manpower, Personnel Capabilities, and Training	
MS	Milestone	
MSC	Major Subordinate Command	
MW	Microwave	
	N	
NASA	National Aeronautics & Space Administration	
NBC	Nuclear, Biological & Chemical	
NBCCS	Nuclear, Biological & Chemical Contamination Survivability	
NDI	Non-developmental Item	
NET	New Equipment Training	
NSS	National Security Systems	
NSTD	Non-system Training Device	
NTIS	National Technical Information Service	
	<b></b>	
O&S	Operation & Support	
ODCS	Office of the Deputy Chief of Staff	
OIPT	Overarching Integrated Product Team	
OMS/MP	Operational Mode Summary/Mission Profile	
ORD	Operational Requirements Document	
OSD	Office of the Secretary of Defense	
OT&E	Operational Test & Evaluation	
OTRR	Operational Test Readiness Review	
OWLKNEST	Operator Workload Knowledge-Based Expert System Tool	
P		
P3I	Pre-planned Product Improvement	
PAL	Parameter Assessment List	
PAL-MATE	Parameter Assessment List - MANPRINT Automated Tool Edition	
Pam	Pamphlet	
PEO	Program Executive Officer	
PESHE	Programmatic, Environment Safety & Occupational Health Evaluation	
PFTEA	Post Fielding Training Effectiveness Analysis	

PM	Program/Project/Product Manager		
PMO	Program/Project/Product Manager's Office		
POC	Point of Contact		
100			
	— <i>R</i> —		
R&D	Research and Development		
RAM	Reliability, Availability, and Maintainability		
RD&EC	Research, Development, and Engineering Center		
RDA	Research, Development & Acquisition		
RF	Radio Frequency		
RFP	Request for Proposal		
RRC	Requirements Review Committee		
	—S—		
S&T	Science & Technology		
SA	Supportability Analysis		
SCP	Software Change Package		
SDD	System Development and Demonstration		
SES	Senior Executive Service		
SI	Skill Identifier		
SIPT	Supportability Integrated Product Team		
SMART	Simulation and Modeling for Acquisition, Requirements, and Training		
SME	Subject Matter Expert		
SMMP	System MANPRINT Management Plan		
SoS	System-of-Systems		
SORD-PT	Soldier-Oriented Research & Development in Personnel & Training		
SOW	Statement of Work		
SQI	Skill Qualification Identifier		
SRO	System Readiness Objectives		
SS	System Safety		
SSEB	Source Selection Evaluation Board		
SSP	Simulation Support Plan		
SSv	Soldier Survivability		
STRAP	System Training Plan		
STRICOM	Simulation, Training and Instrumentation Command		
STREEN	—T—		
TAD	Target Audience Description		
TADSS	Training Aids, Devices, Simulators and Simulations		
TDS	Technology Development Strategy		
TDA	Table of Distribution and Allowances		
T&E	Test & Evaluation		
TEA	Training Effectiveness Analysis		
TEMO	Training, Exercise, and Military Operations		
TEMP	Test and Evaluation Master Plan		
TEP	Test Evaluation Plan		
11/1	Lost Dyminution 1 iun		

TER	Test and Evaluation Report		
TNGDEV	Training Developer		
TOE	Table of Organization and Equipment		
TOS	Target Occupational Specialty		
TRAC	TRADOC Analysis Center		
TRADOC	Training and Doctrine Command		
TSM	TRADOC System Manager		
TTSP	Training Test Support Package		
— <b>U</b> —			
UFD	User Functional Description		
URS	Unit Reference Sheets		
USAFMSA	U.S. Army Force Management Support Activity		
USD (A&T)	Under Secretary of Defense for Acquisition & Technology		
USD (AT&L)	Under Secretary of Defense for Acquisition, Technology and Logistics		
<i>W</i>			
WBS	Work Breakdown Structure		
WinCrew	Windows Crew		
WIPT	Working Level Integrated Product Team		
WRAP	Warfighting Rapid Acquisition Program		

## **APPENDIX B**

#### **DEFINITIONS**

#### This appendix contains definitions for MANPRINT-related terms.



Acquisition Program Baseline (APB): Each program's APB is developed and updated by the program manager and will govern the activity by prescribing the cost, schedule and performance constraints in the phase succeeding the milestone for which it was developed.

Acquisition Strategy: The method utilized to design, develop, and deploy a system through its life cycle. It contains the PM's strategy for MANPRINT/HSI.

Army Systems Acquisition Review Council (ASARC): Top level DA corporate body for systems acquisition that provides advice and assistance to the Secretary of the Army and Army Acquisition Executive (AAE). Reviews major defense acquisition programs and Army designated acquisition programs.

Analysis of Alternatives (AoA): The evaluation of the operational effectiveness, operational suitability and estimated costs of alternative systems to meet a mission capability. The analysis assesses the advantages and disadvantages of alternatives being considered to satisfy capabilities, including the sensitivity of each alternative to possible changes in key assumptions or variables.

Automated Information System (AIS): An acquisition program consisting of IT, except when it involves equipment that is an integral part of a weapon system or weapons system; or is a tactical communication system.



Capability Development Document (CDD): A document that captures the information necessary to develop a proposed program(s), normally using an evolutionary acquisition strategy. The CDD outlines an affordable increment of militarily useful, logistically supportable and technically mature capability.

Capability Gaps: Those synergistic resources that are unavailable, but potentially attainable to the operational user for effective task execution. These resources may come from the entire range of DOTMLPF solutions.

Capability Production Document (CPD): A document that addresses the production elements specific to a single increment of an acquisition program.

Combat Developer (CBTDEV): Command or agency that formulates doctrine, concepts, organization, materiel requirements, and objectives. It may be used generically to represent the user community role in the materiel acquisition process (counterpart to generic use of MATDEV). Capstone Requirements Document (CRD): A document that contains capabilities-based requirements that facilitates the development of CDDs and CPDs by providing a common framework and operational concept to guide their development.



Early Comparability Analysis (ECA): The ECA is an analytical process used for identification of MPT high-driver tasks in current, predecessor, or systems similar to that being developed. The objective is to design the new system such that these negative characteristics are avoided or minimized. A secondary benefit of the ECA is that insights may be gained into how to mitigate these impacts with the current system, either through changes in manning, personnel considerations, or training fixes.



Family of Systems (FoS): A set or arrangement of independent systems that can be arranged or interconnected in various ways to provide different capabilities. The mix of systems can be tailored to provide desired capabilities, dependent on the situation. An example of a FoS would be a family of armored vehicles developed for urban warfare. The FoS consisting of armored personnel carriers, Combat Engineer Crew, Nuclear, Biological, and Chemical (NBC) vehicle, Ambulance vehicle, mobile sensor systems, and other additional systems. Although these systems can independently provide militarily useful capabilities, in collaboration they can fully satisfy a more complex and challenging capability.

*Functional Expert*: An individual who is an expert in a MANPRINT-related functional area (e.g., logistics, testing).

Functional Proponent (FP): The representative of the Army agency responsible for the subject area in which Information Mission Area (IMA) resources are utilized or are to be utilized for MAIS.

HARDMAN (Hardware vs. Manpower) Comparability Methodology (HCM): The HCM is an analytical tool, developed first by the Navy and adapted for use by the Army, used to estimate the quantitative manpower, personnel, and training requirements associated with the new system. The methodology is expensive, time-consuming, and requires a mainframe computer. However, selected portions of the methodology can be modified and used effectively. The HARDMAN methodology has evolved into IMPRINT. (See the definition below)

Health Hazard (HH) (MANPRINT Domain): The inherent conditions in the use, operation, maintenance, repair, support, storage, and disposal of a system (e.g., acoustical energy, biological substances, chemical substances, oxygen deficiency, radiation energy, shock,

temperature extremes, trauma, and vibration) that can cause death, injury, illness, disability, or reduce job performance of personnel.

Health Hazard Assessment (HHA): A report, which identifies potential health hazards, assigns risks, and provides recommended solutions that may be associated with the development, acquisition, operation, and maintenance of Army systems. The purpose is to preserve and protect the humans who will operate, maintain and support the equipment; enhance total system effectiveness, reduce system retrofit needed to eliminate health hazards; reduce readiness deficiencies attributable to health hazards; and reduce personnel compensation. The Army HHA Program at CHPPM prepares the Health Hazards Assessment Report (HHAR).

Human Factors Engineering (HFE) (MANPRINT Domain): The comprehensive integration of human characteristics (including limitations or constraints) into system definition, design, development, and evaluation to optimize total system performance (the human-machine system) under operational conditions.

Human Factors Engineering Domain Assessment: A report prepared by ARL-HRED that reviews the status of human factors engineering as the system approaches the end of a life cycle phase. A major purpose of the report is to identify any design flaws which, taken singularly or collectively, may be so objectionable that, if not remedied, might warrant a decision not to transition to the next phase. It will also identify issues and concerns that, while not critical, should be resolved to enhance total system operational effectiveness.

Human Systems Integration (HSI): HSI is a comprehensive management and technical strategy, initiated early in the acquisition process, to ensure that human performance, the burden the design imposes on MPT, and safety and health aspects are considered throughout the system design and development processes. Human factors engineering requirements are also established to develop effective human-machine interfaces, and minimize or eliminate system characteristics that require extensive cognitive, physical, or sensory skills; to require excessive training or workload for intensive tasks; or to result in frequent or critical errors or safety/health hazards. The capabilities and limitations of the operator, maintainer, repairer, trainer, and other support personnel shall be identified prior to program initiation and refined during the development process (See DoDI 5000.2, Enclosure 7, Human Systems Integration [HSI].) MANPRINT is the Army's process for HSI.



Improved Performance Research Integration Tool (IMPRINT): A MANPRINT tool consisting of multiple software components which can be used either singly or in a combination for a determination of the number, attributes, availability, and training needs of soldiers required to operate and maintain Army systems. It can be used to develop constraints and subsequently, to evaluate requirements.

*Information Technology Overarching Integrated Product Team (IT OIPT):* The IT OIPT is the senior advisory body to the MDA, providing advice on program readiness to proceed into subsequent Life Cycle Model (LCM) phases, and as to whether proposed plans for the subsequent LCM phases are consistent with sound management practices.

Initial Capabilities Document (ICD). Documents the need for a materiel approach to a specific capability gap derived from an initial analysis of materiel approaches executed by the operational user and, as required, an independent analysis of materiel alternatives. It defines the capability gap in terms of the functional area, the relevant range of military operations, desired effects and time. The ICD summarizes the results of the DOTMLPF analysis and describes why nonmateriel changes alone have been judged inadequate in fully providing the capability.

Integrated Capabilities Development Team (ICDT): An integrated team made up of people from multiple disciplines formed to develop concepts, conduct a capabilities-based assessment to identify gaps in capability, identify non-material and/or materiel approaches to resolve those gaps, and develop capabilities documents, when directed. ICDTs maximize the efforts of reduced resources by early resolution of issues through timely involvement of appropriate agencies/expertise as a team with a commitment to aggressively identify and work issues.

*Integrated Product Team (IPT)*: A team of representatives from all appropriate functional disciplines working together to build successful programs, identify and resolve issues, and provide recommendations to facilitate sound and timely decisions.

Integrating Integrated Product Team (IIPT): An IIPT is a form of Working-Level IPT. It is headed up by the PM; its purpose is to coordinate WIPT efforts and cover all topics not otherwise assigned to another IPT.

Joint Capabilities Integration and Development System (JCIDS): Policies and procedures to us in identifying, assessing, and prioritizing join military capability needs (See CJCSI 3170 and CJCSM 3170.)

Joint Requirements Oversight Council (JROC): A joint council that validates and approves JCIDS documents/proposals or returns them to the sponsor for additional information.

*Key Performance Parameters (KPP):* Those minimum attributes or characteristics considered most essential for an effective military capability.



Life Cycle Management Model (LCM): A management process, applied throughout the life of a system, which bases all programmatic decisions on the anticipated mission-related and economic benefits derived over the life of the system.

## \_M\_

Major Automated Information System Review Council (MAISRC): The MAISRC has been replaced by the IT OIPT.

*Manpower (MANPRINT Domain)*: The number of men and women, military and civilian, required, authorized and potentially available to train, operate, maintain, repair, supply, transport and provide base support for a system.

MANPRINT (Manpower and Personnel Integration): The comprehensive technical effort to identify and integrate all relevant information and considerations regarding the full range of manpower, personnel, training, human factors engineering, system safety, health hazards, and soldier survivability into the system development and acquisition process to improve individual performance, total system performance, and reduce the cost of ownership throughout the entire life cycle of a system.

*MANPRINT Action Officer (AO)*: An individual held accountable by the PM or (Branch, Specified or Functional) Proponent for assisting the implementing and managing of MANPRINT inputs and activities.

*MANPRINT Assessment (MA)*: MAs are prepared under the authority of the HQDA, G-1 and address unresolved critical MANPRINT risks to the MDA for ASARCs, IT OIPTs, and other acquisition decision reviews. Assessments will normally assign a RED (R), AMBER (A), or GREEN (G) rating.

- a. Red (R). Critical risks identified (show stopper) with no solution identified or solution being implemented with less than satisfactory results projected by the next milestone date.
- b. Amber (A). Significant or minor risks identified, with a solution or work-around plan expected to be completed by the next major milestone date.
- c. Green (G). No risks. All actions on schedule.

*MANPRINT Plan:* The MANPRINT Plan is the Army's HSI Plan as required by DoDI 5000.2, Enclosure 7. It serves as a planning and management guide and as an audit trail to identify tasks, analyses, tradeoffs, and decisions that must be made to address MANPRINT issues during the system development and acquisition process. The MANPRINT Plan is updated as needed throughout the acquisition process.

MANPRINT Risks: MANPRINT representatives support the IPT process by identifying and elevating MANPRINT related risks to the PM, the CBTDEV and the TSM for risk management, mitigation, or resolution. Unresolved critical risks are addressed in MAs to the MDA for ASARCs, IT OIPTs, and other acquisition decision reviews. The PM will address the risks, their impact on supportability, and life cycle costs, and their planned resolution in the Modified Integrated Program Summary (MIPS). Risks are defined as critical, major, or concern.

- a. Critical. A risk regarding one or more of the MANPRINT domains, which warrants immediate attention/resolution to preclude serious risk to the program and the Army, regarding one or more of the following areas: high probability for catastrophic injury or death to the crew or other friendly personnel; seriously degraded mission performance or effectiveness; the requirement for major un-programmed MPT resources; or jeopardized ability of the MPT community (HQDA, G-1; TRADOC; HRC, etc.) to support system fielding with trained available personnel. Critical unresolved risks will be addressed in a MA and reported to the MDA. Critical risks often result in an overall RED rating to the program (that is, a recommendation that the program not be allowed to proceed to the next phase until the risks are resolved or have been mitigated).
- b. Major. Risk regarding one or more of the MANPRINT domains that at the time of the rating will not preclude the program from proceeding to the next acquisition phase. Major risks often differ from those deemed as critical in that the degree of severity or the probability for occurrence is lower, or there is adequate time within the program schedule to resolve or mitigate the risk.
- c. Concern. Concerns are potential risks regarding one more of the MANPRINT domains lacking sufficient supporting data or analyses. Actions to provide data and/or analyses should be accomplished as early as possible to determine the severity of the potential risk or the degree of probability for occurrence. This will facilitate risk resolution or mitigation.

MANPRINT Working-Level Integrated Product Team (MANPRINT WIPT): A body of experts in the MANPRINT domains and other functional areas who are responsible for assisting the PM in applying MANPRINT principles and practices to the system. WIPT members also assist the PM by early identification of risks, as well as, assist in risk resolution.

*Materiel Developer (MATDEV):* The RDA command, agency, or office assigned responsibility for the system under development or being acquired. The term may be used generically to refer to the RDA community in the materiel acquisition process (i.e., Program/Product/Project Manager) (counterpart to the generic use of CBTDEV).

*MPT Assessment:* Assesses the manpower, personnel capabilities and training risks of the system. It identifies any/all risks/issues prior to the milestone review. U.S. Army HRC, DCSOPS, MPT Domain Branch conducts the assessments on new and improved MAIS, MDAPs and Major Systems. ARL-HRED conducts the assessments on non-major systems when required.

MPT Guide: The MPT Domain Branch has developed this MPT Guide to help MANPRINT and HSI Analysts and AOs determine the MPT Risks of systems in the DoD Acquisition process. The MPT Guide presents a series of questions, keyed to the approximate phase in the acquisition process, that assists MANPRINT Action Officer in identifying issues or questions that should be asked.

Milestone Decision Review (MDR): The decision point, separating life cycle phases, at which the system's status is assessed for fitness to proceed to the next phase. The activities that have been performed in the preceding acquisition phase, the status of program execution and program

management's plans, are assessed and exit criteria for the next acquisition phase are established during the milestone review and decision process.



Non-Developmental Item (NDI)/Commercial Off-The Shelf (COTS): A broad, generic term that covers materiel available from a wide variety of sources with little or no development effort required by the government. NDI/COTS items include items: available in the commercial marketplace; already developed and in use by other U.S. military services, government agencies, or by a foreign government with which the United States has a mutual defense cooperation agreement; already being produced, but not yet available in the commercial marketplace.



Overarching Integrated Product Team (OIPT): OIPTs are formed to provide assistance, oversight and review as a program proceeds through its acquisition life cycle. They are composed of the PM, PEO, Component Staff, Joint Staff (if applicable), Under Secretary of Defense for Acquisition & Technology (USD (A&T)), and the Office Secretary of Defense (OSD) staff principals or their representatives.



*Personnel Capabilities (MANPRINT Domain)*: The cognitive and physical capabilities required to be able to train for, operate, maintain and sustain materiel and information systems. Included are the human aptitudes, skills, knowledge, and experiences required to perform job tasks included in the total system design compared to these characteristics possessed by the target audience.

*Program/Project/Product Manager (PM)*: A HQDA board-selected manager for a system or program. A PM may be subordinate to the AAE, PEO, or a materiel command commander. The title refers to the level of intensity the Army assigns to particular weapon or information systems. As a rule, a Program Manager is a General Officer or Senior Executive Service (SES); a Project Manager is a Colonel or GS-15; and a Product Manager is a Lieutenant Colonel or GS-14.



Soldier Survivability (SSV) (MANPRINT Domain): The design characteristics or operational requirements of a system that: reduce detectability by the enemy; reduce fratricide; facilitate cover and concealment; minimize likelihood and extent of injuries if engaged; and minimize physical and mental fatigue (a design concern shared with human factors engineering).

*Soldier Survivability Domain Assessment*: A report which addresses the system's ability to reduce fratricide, detectability, and probability of being attacked, as well as minimize system damage, soldier injury, and cognitive and physical fatigue. ARL-SLAD prepares this report for ACAT I& II programs. ARL-HRED prepares the report for ACAT III programs.

System MANPRINT Management Plan (SMMP): The SMMP has been replaced by the MANPRINT Plan.

System of Systems (SoS): A set or arrangement of interdependent systems that are related or connected to provide a given capability. The loss of any part of the system will degrade the performance or capabilities of the whole system. An example of a SoS could be interdependent information systems. While individual systems within the SoS may be developed to satisfy the particular needs of a given user group (like a specific Service or agency), the information they share is so important that the loss of a single system may deprive other systems of the data needed to achieve even minimal capabilities.

System Safety (SS) (MANPRINT Domain): The application of engineering and management principles, criteria, and techniques to optimize safety within the constraints of operational effectiveness, time, and cost throughout all phases of the system life cycle.

System Safety Domain Assessment: A report which assesses the overall safety of the emerging or changing system and ensures that system safety hazards and risks, and recommended solutions, are integrated into the acquisition program. For major materiel systems, the U.S. Army Combat Readiness Center prepares this report; for AIS, AMC prepares the report; and for non-major systems, the AMC safety office prepares the report.



Target Audience Description (TAD): The TAD lists occupational identifiers for personnel who are projected to operate, maintain, repair, train, and support a specific future Army or Joint Services system. Further, for each identifier, the TAD provides an information source which will describe the characteristics of the personnel identified. Describing projected system personnel early in the acquisition process increases the Army's flexibility to achieve the best system solution in terms of design, affordability, supportability and performance. Early identification of the target audience remains essential.

Total System: A total system includes not just the prime mission equipment, but the personnel who operate and maintain the system; how system security procedures and practices are implemented; how the system operates in its intended operational environment; how the system will be able to respond to any effect unique to that environment (such as NBC or information warfare); how the system will be deployed to this environment; the system's compatibility, interoperability, and integration with other systems; the operational and support infrastructure (including Command, Control, Communications, Computers and Intelligence (C4I)); training and training devices; any data required by the system in order for it to operate; and the system's potential impact on the environment and environmental compliance.

Total System Performance: Total system performance is customarily measured in two areas: effectiveness and suitability. Operational effectiveness is defined as the overall degree of mission accomplishment of a system when operationally employed by representative personnel in the environment (e.g., natural, electronic, threat, etc.). Other factors affecting this will be doctrine, tactics, environment, survivability, vulnerability, and threat (including countermeasures; initial nuclear weapons effects; nuclear, biological, and chemical contamination threats). Operational suitability is defined as the degree to which a system can be satisfactorily placed in field use with consideration given to availability, compatibility, transportability, environment, interoperability, reliability, wartime usage rates, maintainability, safety, human factors, manpower supportability, logistic supportability, and training requirements.

Tradeoff Analyses: The system acquisition process consists of a continuous series of tradeoffs both at the macro and micro level. The critical factor is the "trade space". This is the range between objective and threshold that can be traded-off by the PM. The best time to reduce lifecycle costs is early in the acquisition process. Cost reductions should be accomplished through cost/performance tradeoff analyses conducted before an acquisition approach is finalized. MANPRINT should significantly impact the operating and support costs as part of the life-cycle costs. Every MANPRINT domain has its own cost implications and potential cost savings/avoidance.

Training (MANPRINT Domain): Consideration of the necessary time and resources required to impart the requisite knowledge, skills, and abilities to qualify Army personnel for operation, maintenance, repair, and support of Army systems. It involves (1) the formulation and selection of engineering design alternatives which are supportable from a training perspective (2) the documentation of training strategies, and (3) the timely determination of resource requirements to enable the Army training system to support system fielding. It includes analyses of the tasks performed by the operator, maintainer, repairer, and supporter; the conditions under which they must be performed; and the performance standards, which must be met. Training is linked with personnel analyses and actions in that availability of qualified personnel is a direct function of the training process.



Working-level Integrated Product Team (WIPT): WIPTs are a form of IPT. They are made up of representatives from the PM office, Combat Development organization, DA staff, contractors, and other functional experts. They are chaired by the PM or the PM's designated representative. Their purpose is to assist the PM to efficiently develop/acquire the new system by addressing all facets of the life cycle on as much of a real-time basis as is possible. Early identification of issues and assistance in resolving them is a responsibility of the WIPT members.

## APPENDIX C

#### **PUBLICATIONS**

This appendix contains a list of documents, along with brief synopses, that the MANPRINT AO may consult for more specific information. The list includes DoDD/DoDI and Regulations, AR, DA PAM, TRADOC, AMC publications, and other miscellaneous documents. The underlined blue text contains hyperlinks to publications.

Cited AR, DA PAM, TRADOC and AMC of which many are available for download and hard copy publications can be obtained from:

Commander
U.S. Army Publications Distribution Center
1655 Woodson Road
St. Louis, MO 63114-6128

You must have a valid account number to order publications. Questions about establishing an account should be referred to the U. S. Army Publications Distribution Center. This is a source for Government activities only. Government contractors should receive publications through their Contracting Officers Representative (COR).

The <u>U.S. Army Publishing Agency</u> or the <u>Army Publishing Directorate</u> on the World Wide Web for those that have Internet access. Also visit TRADOC Publications.

In the event that you need a DoD document that is not carried at the U.S. Army Publications Distribution Center, you can obtain it from the <u>National Technical Information Service (NTIS)</u> (Internet). The documents provided from NTIS are not free of charge and prepayment in the form of a credit card or check is required. It is also possible to establish an NTIS deposit account. In addition to the basic cost of the document, NTIS charges a handling fee.

National Technical Information Service (NTIS) 5285 Port Royal Springfield, VA 22161 1-800-553-6847

## Federal Acquisition Regulation (FAR)

The FAR was established to codify uniform policies for acquisition of supplies and services by executive agencies. It is issued and maintained jointly, pursuant to the OFPP Reauthorization Act, under the statutory authorities granted to the Secretary of Defense, Administrator of General Services and the Administrator, National Aeronautics and Space Administration. Statutory authorities to issue and revise the FAR have been delegated to the Procurement Executives in DOD, General Services Administration (GSA) and National Aeronautics and Space Administration (NASA).

#### DoD 5000 Series Resource Center

The DoD 5000 Resource Center provides acquisition links to publications and help for acquisition policy. An outstanding web site loaded with the latest DoD acquisition information.

### Acquisition Knowledge Sharing System

The AT&L (Acquisition, Technology & Logistics) Knowledge Sharing System (AKSS) serves as the central point of access for all AT&L resources and information, and communicates acquisition reform. As the primary reference tool for the Defense AT&L workforce, it provides a means to link together information and reference assets from various disciplines into an integrated, but decentralized information source.

### DoDD 5000.1, The Defense Acquisition System

The purpose of this directive is to provide management principles and mandatory policies and procedures for managing all acquisition programs.

## DoDI 5000.2, Operation of the Defense Acquisition System

This regulation establishes mandatory procedures for MDAPs and MAIS acquisition programs. It also describes the HSI concept and requirements which are implemented through the U.S. Army MANPRINT Program. Specific HSI (i.e., MANPRINT) PM responsibilities are addressed at Enclosure 7.

## Chairman of the Joint Chiefs of Staff Instruction CJCSI 3170.01D

Also visit this site for a copy of CJCSI 3170.01D <a href="http://dod5000.dau.mil/">http://dod5000.dau.mil/</a>

The purpose of this instruction is to establish the policies and procedures of the JCIDS. The procedures established in the JCIDS support the Chairman of the Joint Chiefs of Staff (CJCS) and the JROC in identifying, assessing and prioritizing joint military capability needs.

## Chairman of the Joint Chiefs of Staff Manual CJCSM 3170.01

Also visit this site for a copy of CJCSM 3170.01 <a href="http://dod5000.dau.mil/">http://dod5000.dau.mil/</a>

CJCSM sets forth guidelines and procedures for operation of the JCIDS regarding the development and staffing of JCIDS documents.

### AR 25-1, "The Army Information Management Program"

This regulation establishes the policies and assigns responsibilities for the management of information resources and information technology. It applies to information technology contained in command and control systems, intelligence systems, business systems and national security systems developed or purchased by the Department of Army. It implements the provisions of Public Law 104-106, Clinger-Cohen Act of 1996 (formerly Division E, Information Technology Management Reform Act, Defense Authorization Act of 1996), the Paperwork Reduction Act of 1995 (as amended), DODI 7740.3, and other related DoD directives. It addresses the management of information as an Army resource, the technology supporting information requirements, and the resources supporting C4I. The COOP ensures the Army mission and processes continue to function, even in the event of a disaster, and have MANPRINT implications.

## AR 40-10, "Health Hazard Assessment Program in Support of the Army Materiel Acquisition Decision Process"

This regulation prescribes specific responsibilities of developers for HHAs in support of the Army Materiel Acquisition Decision Process. It describes the HHA program and addresses program objectives and policies. While this regulation is obviously dated, the U. S. Army CHPPM has also published the "Materiel Developer's Guide to Systems Health Hazards."

## AR 70-1, "Army Acquisition Policy"

This regulation governs the research, development, acquisition, and LCM of Army materiel and automated information systems to satisfy approved Army requirements. It applies to major, nonmajor, and highly sensitive classified programs. It complements AR 602-2 in assigning MANPRINT and MANPRINT domain responsibilities in the system acquisition program. It consolidates AR 25-3, AR 700-86, and AR 702-3. It is the Army's implementation of DoD Acquisition Policy.

# AR 70-8, "Soldier-Oriented Research and Development in Personnel and Training"

The Soldier-Oriented Research and Development in Personnel and Training (SORD–PT) program goal is to provide the technological edge necessary to ensure that the Army can recruit and maintain a total force, trained and ready to carry out its assigned roles anywhere in the world, anytime.

## AR 70-75, "Survivability of Army Personnel and Materiel"

This regulation provides policies, responsibilities, and procedures for ensuring that survivability of Army personnel and materiel are addressed in the materiel acquisition process. While survivability is addressed as an Army program, soldier survivability is identified as a domain of MANPRINT. It addresses survivability in the requirements process, the threat process, analysis, system design, testing, evaluation and assessment.

## AR 71-32, "Force Development and Documentation—Consolidated Policies"

This regulation consolidates and updates the objectives, procedures, and responsibilities for development and documentation of Army force personnel and equipment requirements and authorizations. It includes information previously contained in:

AR 71-2, BOIPs and BOIPFD. This regulation primarily impacts the manpower domain but also impacts the Personnel Capabilities Domain of MANPRINT. USAFMSA Requirements Documentation Website is the public home page for the restricted USAFMSA Requirements Documentation website. The actual data is restricted to military use and is not available to the public. You will need to establish authorization to use this web site. USAFMSA provides requirements documentation for the U.S. Army:

- Tables of Organization and Equipment (TOE)
- Basis of Issue Plans (BOIP)
- Manpower Requirements Criteria (MARC) on the <u>Force Management Bulletin Board</u> (FMBB)

## AR 73-1, "Test and Evaluation Policy"

AR 73-1 prescribes implementing policies for the Army's testing and evaluation program. It applies to all systems acquired under the auspices of the AR 70-series and AR 25-series. It defines specific agency responsibilities to include the test and evaluation organizations. It describes test and evaluation support of the system acquisition process, including developmental and operational testing and evaluation. It provides for interface with the MANPRINT WIPT. It incorporates MANPRINT in the Test Developmental Independent Assessment Report and the Independent Operational Evaluation.

## AR 350-1, "Army Training and Education"

This regulation supersedes AR 350-1, 1 August 1983; AR 351-1, 15 October 1987; AR 350-35, 30 May 1990; and AR 350-41, 19 March 1993. The principal objective of Army training and education is to develop and maintain unit combat readiness. The three pillars of the Army's training and education system are: individual training and education (training in schools and through distance learning), operational assignments, and self-development training. Each of the

pillars attempts to enhance the ability of Army units, organizations, and individuals to perform their missions.

### AR 380-19, "Information Systems Security"

Information Systems Security (ISS) as a discipline which encompasses the sub-areas of communications security (COMSEC), computer security (COMPUSEC), emissions security (EMSEC) and electronic security (ELSEC). It defines the Army Information Systems Security Program and prescribes a structure for implementing the program. There are obvious implications for security clearances, which impact personnel capabilities. Of special interest was the requirement for maintenance personnel to be cleared for the highest level of security processed on the system.

## AR 385-10, "The Army Safety Program"

AR 385-10 prescribes DA policy, responsibilities, and procedures to protect and preserve Army personnel and property against accidental loss. It provides public safety for Army operations and activities, and safe and healthful workplaces, procedures, and equipment.

## AR 385-16, "System Safety Engineering and Management"

AR 385-16 prescribes policies and procedures, and identifies responsibilities to ensure hazards in Army systems and facilities are identified and the risks associated with these hazards are properly managed. The Director of Army Safety (DASAF) will manage the Army System Safety Program and its interface with MANPRINT. The Commander, U. S. Army Combat Readiness Center will provide an independent safety assessment of ASARC systems to the ASARC secretary and a copy to ODCS, G-1 for MANPRINT use. System safety risks will be addressed in MAs. System safety will be applied and tailored to all Army systems and facilities throughout their respective life cycles and integrated into other MANPRINT concerns.

## AR 602-1 "Human Factors Engineering Program"

This regulation covers policies and procedures for HFE in the Army. Responsibilities are identified and guidance is provided on implementing a HFE program throughout the life cycle system management of Army materiel. This regulation also implements HFE policies and procedures specified in AR 602-2.

# AR 602-2, "Manpower and Personnel Integration (MANPRINT) in the System Acquisition Process"

This is the MANPRINT regulation. It prescribes MANPRINT policy, responsibilities, and documentation requirements for implementing and supporting MANPRINT which fulfills the Army's HSI responsibilities in accordance with DoDD 5000.1 and DoDI 5000.2. IT IS CURRENTLY UNDER REVISION.

## AR 700-127, "Integrated Logistic Support (ILS)"

This regulation delineates DA policies and assigns responsibilities for management of ILS. The 10 ILS elements are:

- 1. Maintenance planning
- 2. Manpower and personnel
- 3. Supply support
- 4. Support equipment
- 5. Technical data
- 6. Training and training support
- 7. Computer resources support
- 8. Facilities
- 9. Packaging, handling, storage and transportation
- 10. Design interface

The specific goal/objective of the ILS program is to introduce and sustain fully supportable materiel systems in current and projected environments that meet established operational and system readiness objectives (SRO) at minimum life-cycle cost (LCC). The ILS and MANPRINT processes are mutually supporting and will be integrated in materiel development and acquisition efforts. MANPRINT is a mandatory consideration for attaining the desired level of supportability. A fundamental precept of ILS is that each element will be integrated with every other element. The MANPRINT considerations must be afforded this same management information. The regulation directs that the ILS Manager will also serve as the MANPRINT manager when program size, complexity, or other factors permit. When it is not practical for the ILS Manager (ILSM) to serve as the MANPRINT manager, the two will be aligned to serve mutually supporting roles to prevent duplication of effort. The regulation clearly demonstrates the relationship of MANPRINT to each of the ILS elements.

## DA PAM 70-3, "Army Acquisition Procedures"

DA Pam 70-3 provides guidance for Army acquisition. The acquisition process is designed to provide a needed capability to the warfighter in the shortest practical time and concurrently reducing risk, ensuring affordability, and providing adequate information for decision-making.

## DA PAM 73-1, "Test and Evaluation in Support of System Acquisition"

DA Pamphlet 73-1 provides guidance and procedures to implement test and evaluation policy for materiel and information systems as promulgated in AR 73-1. There is a requirement for a MANPRINT representative to serve as a member of the T&E WIPT. Specific MANPRINT responsibilities as they relate to Test and Evaluation are assigned to the Deputy Chief of Staff, G-1. The U. S. Army Research Laboratory is identified as having the function of conducting MANPRINT analyses.

## DA PAM 385-16, "System Safety Management Guide"

This system safety "how to" guide discusses MANPRINT and the relationship of system safety to MANPRINT. Included is relationship with the System Safety Working Group and input to MANPRINT assessments.

## DA Pam 611-21, "Military Occupational Classification and Structure"

This pamphlet describes the MOS series, identifies qualifying criteria, and provides guidance for classification of positions. It also identifies unique skill identifiers and the use of those codes in positions. This is a key personnel capabilities publication and it also impacts the MANPRINT domains of manpower, training, and human factors engineering. The two web site addresses in this paragraph are on a secure site. The user may have to copy the addresses to their web browser and then hit enter to gain access. The latest Officer, Warrant Officer and Enlisted MOS series may be viewed at:

 $\underline{https://www.armyg1.army.mil/pamxxi/secured/mosstructure/mos-charts.asp}$ 

The most up-to-date information for Officers, Warrant Officers and Enlisted MOS may be viewed at: <a href="https://perscomnd04.army.mil/MOSMARTBK.nsf/">https://perscomnd04.army.mil/MOSMARTBK.nsf/</a>

## <u>Assistant Secretary of the Army (Acquisition, Logistics and Technology)</u> <u>ASA(ALT) Webportal</u>

The ASA(ALT) website provides a Digital Library, identifies the ASA(ALT) Directorates, links to PEOs/PMs, and Field Operating Agencies (FOAs). The site is very useful for keeping well informed about what is happening in the acquisition community. There are also links to ASA(ALT) Bulletins, ACAT Listing, the Acquisition Desk book, etc. This is an excellent web site to add to "Favorites" on your web browser.

## TRADOC Developments Library

This web site contains the TRADOC Acquisition Developments Library guidance and numerous links to DoD and Army web sites.

## TRADOC Reg 350-70, "Systems Approach to Training Management, Processes, and Products"

This regulation provides complete, comprehensive policy and guidance on Army training. Of special interest are portions of the regulation applicable to the system acquisition process and MANPRINT.

This pamphlet prescribes the processes for determining, documenting, and approving warfighting requirements in the DOTMLPF. Of special interest to MANPRINT is the analytical effort leading to the ICD, the CDD and the CPD. Also of special interest is the guidance on the ICT

and MANPRINT representation. The MANPRINT AO must ensure attendance at any of these ICT/IPTs.

## "Acquisition Strategy Guide—Third Edition,"

This guide was developed for use by PMs. The guide states that Army materiel developers coordinate the Acquisition Strategy with the HSI Office. This is the MANPRINT Directorate of ODCS G-1. The HSI Plan is listed as a functional plan.

## **APPENDIX D**

## KEY MEMBERS MANPRINT POC LIST

AGENCY	ADDRESS	POC/TELEPHONE	REMARKS
G-1	Office of the Deputy Chief of Staff, G-1, MANPRINT Directorate HQDA (DAPE-MR) 300 Army Pentagon Washington, DC 20310-0300	Dr. Michael Drillings Director  (703) 695-6761 or DSN 225-6761 Michael.Drillings@hqda.army.mil  Dr. Beverly Knapp Deputy Director  (703) 695-9215 DSN 225-9215 Beverly.Knapp1@hqda.army.mil  Mr. Taylor Jones  (256) 842-9558 DSN 746-9558 FAX (256) 876-3728 Lauris.Jones@amrdec.army.mil  Ms. Teresa Hanson  (703) 695-5848 DSN 225-5848 Teresa.Hanson@hqda.army.mil  Ms. Crystal Newsome  (703) 695-5820 DSN 225-5820 Crystal.Newsome@hqda.army.mil  MANPRINT Directorate FAX  (703) 695-6997/DSN 225-6997	Provides MANPRINT expertise; Develops MANPRINT policy and guidance; Develops and approves MANPRINT Assessments.  http://www.manprint.army .mil

AGENCY	ADDRESS	POC/TELEPHONE	REMARKS
DISC4	Director of Information Systems for Command, Control, Communications, and Computers ATTN CIO/G-6 SAIC-ICE 107 Army Pentagon Washington, DC 20310-0107	Mr. Don Routten (703) 602-5766 routtdw@hqda.army.mil	Provides expertise on AIS effectiveness
HQ, AMC	HQ, Army Materiel Command ATTN: AMXIP-OB 5001 Eisenhower Avenue Alexandria, VA 22333-0001	Dr. Rodney Smith Army Materiel Command AMXIP-OB icpa@hqamc.army.mil	MANPRINT POC
HQ, TRADOC	Commander, TRADOC ATTN: ATCD-RP Ft Monroe, VA 23651-5000	Mr. Steve Dwyer (757) 727-3477 DSN 680-3477 FAX (757) 727-2483 dwyers@monroe.army.mil	Provides assistance from the standpoint of combat developments. TRADOC MANPRINT POC
HRC	U.S. Army Human Resources Command ATTN: AHRC-PLC-M 200 Stovall Street Alexandria, VA 22332-0406	Mr. Wayne Cream (703) 325-2026 DSN 221-2026 FAX (703)325-0657 Wayne.Cream@hoffman.army.mil	Provides MPT expertise; Supports ICTs/IPTs on major systems; Performs MPT Assessments on major systems
USARL- HRED	U.S. Army Research Laboratory Human Research & Engineering Directorate ATTN: AMSRL-HR-M Building 459 Aberdeen Proving Ground, MD 21005-5425	Frank Paragallo DSN: 298-6356 COMM: 410-278-5916 FAX: 410-278-0505 frp@arl.army.mil	Provides MANPRINT focal points to ICTs and IPTs; Provides HFE expertise; Develops HFE and draft MANPRINT Assessments; Provides MPT and Soldier Survivability expertise on non-major systems.

AGENCY	ADDRESS	POC/TELEPHONE	REMARKS
USARL- SLAD	U.S. Army Research Laboratory Survivability/Lethality Analysis Directorate ATTN: AMSRL-SL-BE Aberdeen Proving Ground, MD 21005-5068	Mr. Rich Zigler (410) 278-8625 DSN 298-8625 FAX (410) 278-7254 rzigler@arl.mil	Performs Soldier Survivability Assessments; Provides Soldier Survivability-related expertise.
СНРРМ	U.S. Army Center for Health Promotion and Preventive Medicine ATTN: MCHB-TS-OHH Aberdeen Proving Ground, MD 21010-403	Mr. Robert Gross (410) 436-2925 DSN 584-2925 FAX (410) 436-1016 robert.gross@apg.amedd. army.mil	Provide Health Hazard- related expertise; Performs Health Hazard Assessments
U.S. Army Combat Readiness Center	U.S. Army Combat Readiness Center ATTN: CSSC-ISE Ft Rucker, AL 36362-5363	Mr. Don Wren (334) 255-2744 DSN 558-2744 FAX (334) 255-9478 wrend@safetycenter.army.mil	Performs Independent System Safety Assessments for Materiel Systems; Provides System Safety expertise for Materiel Systems
Army Safety Office	Office of the Director of the Army Staff ATTN: DACS-SF Washington, DC 20310-0200	Mr. Jim Gibson DSN: 225-7291 COMM: 703-601-2409 FAX: 703-601-2417 james.gibson@hqda.army.mil	Safety Policy
Integrated Logistics Support Directorate (ATEC)	U.S. Army Evaluation Center Building 4120 4120 Susquehanna Ave Aberdeen Proving Ground, MD 21005-3013	James Amato Director (410) 306-0357 DSN 458-0357 FAX (410) 306-0479 DSN 458-0479 jamesamato@atec.army.mil	Provides expertise on operational test and evaluation (OT&E)

NOTE: This is only a partial listing of MANPRINT POCs. For a more complete list, visit CONTACTS on the MANPRINT Web Page at:

http://www.manprint.army.mil./manprint/redir.asp?Page=mp-home-main.asp

## **APPENDIX E**

#### SAMPLE MANPRINT/HSI/SUPPORTABILITY/ WIPT CHARTER

#### SYSTEM NAME

#### MANPRINT WIPT CHARTER

- **1. PURPOSE**: To formally charter the (system name) MANPRINT/HSI/Supportability WIPT comprised of representatives of the agencies listed in paragraph 2 below. The primary purpose of the (system name) MANPRINT/HSI/Supportability WIPT is to provide for the comprehensive management and technical effort necessary to assure total system effectiveness. This ensures continuous integration into system development and acquisition of all relevant information concerning manpower, personnel, training, human engineering, system safety, health hazards, and soldier survivability.
- **2. MEMBERSHIP**: The (system name) MANPRINT/HSI/Supportability WIPT will include only those personnel designated as representatives by the member agencies. Changes should be made in writing to the MANPRINT/HSI/Supportability WIPT Chairperson. The (system name) MANPRINT/HSI/Supportability WIPT should be composed of one representative from each of the following organizations:
  - a. Materiel Developer: Agency Name
  - b. Materiel Developer's Representative (prior to Milestone A): Agency Name
  - c. Functional Proponent/Program Manager: Agency Name (Provides Chairperson once appointed)
  - d. Functional Proponent (for AIS) or Combat Developer (for Materiel Systems): Agency Name
  - e. Subject Matter Experts:
    - (1) MPT: U.S. Army HRC, Deputy Chief of Staff for Operations, Force Integration Division, MPT Domain Branch
    - (2) Health Hazards: U.S. Army CHPPM
    - (3) Human Factors Engineering: U.S. ARL-HRED
    - (4) System Safety:
      - For AIS: U.S. AMC
    - For Materiel Systems: U.S. Army Combat Readiness Center or U.S. AMC
    - (5) Soldier Survivability: U.S. ARL-SLAD. (For non-major programs, the SSv assessment is often performed by ARL-HRED if ARL-SLAD does not have

available resources. Check with either ARL-HRED or ARL-SLAD to determine which organization will be performing SSv for a specific ACAT III or IV system, project or product)

- (6) Operational Test and Evaluation: U.S. Army Text and Evaluation Command (ATEC)
- (7) Training: TRADOC
- (8) TRADOC System Manager (When one is appointed)
- f. Additional members or associate members may be added to the MANPRINT /HSI/Supportability Working Group as the need arises.
- **3. OBJECTIVE**: The objective of the (system name) MANPRINT /HSI/Supportability WIPT is to ensure that MANPRINT goals, objectives and issues/risks are adequately addressed. The (system name) MANPRINT/HSI/Supportability WIPT members should:
  - a. Develop and be responsible for tracking MANPRINT issues.
  - b. Provide a forum for direct communications among members to address MANPRINT goals, objectives and risks.
  - c. Participate in the conduct of MANPRINT studies and analyses.
  - d. Provide recommended positions to the PM and the FP (for AIS) and/or CBTDEV (for Materiel Systems).
  - e. Ensure unresolved issues are surfaced to the MANPRINT/HSI/Supportability WIPT Chairperson for resolution.
  - f. Maintain an audit trail of MANPRINT activities and decisions.

#### 4. PROCEDURES:

a. Meetings of the (system name) MANPRINT/HSI/Supportability WIPT will be held at the times and frequencies deemed appropriate by the Chairperson; however, a meeting should be held 6 months (180 days) prior to each milestone decision or system decision point. This is recommended because MANPRINT Assessments should be requested days prior to the Milestone Decision Review date. The Chairperson should provide each member with notification of the time, place, and agenda for each meeting, normally 15 working days prior to the meeting.

b. The Chairperson is responsible for the recording and distribution of minutes of all meetings within ten working days after the meeting. The minutes will include any action items that were assigned as a result of the meeting.

#### c. Members

- (1) Members' agencies are responsible for ensuring their own representation and additional representation as may be indicated by the agenda. The MANPRINT WIPT will include only those personnel designated as representatives by the member agencies. Changes should be made telephonically, in writing or email to the Chairperson.
- (2) Primary or alternate representatives may be present at each MANPRINT WIPT meeting. The agency representative present is the spokesperson for that agency and will have the authority to make decisions in their areas of expertise.
- (3) Activities having limited MANPRINT responsibilities/interests will be requested to attend those meetings, which specifically address their areas of interest.
- d. Subcommittees, if required, are established by the Chairperson.

#### **5. DISTRIBUTION**:

Upon approval, a copy of this charter should be provided to each MANPRINT/ HSI/ Supportability WIPT principal member. Recommend distribution of the Minutes of MANPRINT/HSI/Supportability WIPT meetings be accomplished within ten working days after the meeting.

## **APPENDIX F**

#### **TOOLS**

## Army Manpower Cost System (AMCOS)

The AMCOS is a family of manpower cost models used to forecast the life cycle cost of a new system by year for each MOS. The models incorporate data from a variety of sources and compute cost elements such as military compensation, recruiting, training and medical support for each MOS. The output is used to develop the most cost-efficient system and develop a cost-effective manpower and hardware configuration for the system.

Sponsor: Army Cost and Economic Analysis Center

POC: Mr. George Michael

(703) 681-3336

E-mail: machag@hqda.army.mil

## Improved Performance Research Integration Tool (IMPRINT)

#### What is IMPRINT?

IMPRINT is a MANPRINT/HSI tool developed by ARL-HRED. It is a dynamic, stochastic, discrete event network modeling tool designed to help assess the interaction of soldier and system performance throughout the system lifecycle--from concept and design through field testing and system upgrades. IMPRINT may be used in stand-alone mode or models may be linked through external communication call protocols. IMPRINT is the integrated, Windows follow-on to the Hardware vs. Manpower III (HARDMAN III) tools.

## Why use IMPRINT?

As a system design and acquisition tool, IMPRINT can be used to help set realistic system requirements; to identify soldier-driven constraints on system design; and to evaluate the capability of available manpower and personnel to effectively operate and maintain a system under environmental stressors. IMPRINT is also used to target soldier performance concerns in system acquisition, to estimate soldier-centered requirements early, and to make those estimates count in the decision making process. As a research tool, IMPRINT incorporates task analysis, workload modeling, performance shaping and degradation functions and stressors, and embedded personnel characteristics data.

#### How does IMPRINT do it?

IMPRINT uses Micro Saint, an embedded discrete event task network modeling language, as its engine. Task-level information is used to construct networks representing the flow and the performance time and accuracy for operational and maintenance missions. IMPRINT is used to model both crew and individual soldier performance. For some analyses, workload profiles are generated so that crew-workload distribution and soldier-system task allocation can be

examined. In other cases, maintainer workload is assessed along with the resulting system availability. Also, using embedded algorithms, IMPRINT models the effects of personnel characteristics, training frequency, and environmental stressors on the overall system performance. Manpower requirements estimates can be generated for a single system, a unit, or Army-wide. IMPRINT outputs can be used as the basis for estimating manpower lifecycle costs.

For further information, please contact:

John F. Lockett, III Army Research Laboratory - Human Research & Engineering Directorate ATTN: AMSRD-ARL-HR-MB (Lockett) Bldg 459 Aberdeen Proving Ground, MD 21005-5425

(410) 278-5875 or 5883 FAX: (410)278-5032 DSN: 298-XXXX

**EMAIL:** jlockett@arl.army.mil

## Early Comparability Analysis (ECA)

ECA provides systematic, standardized procedures for evaluating soldier tasks. During the conduct of an ECA, currently fielded equipment is selected to serve as an analytical "stand-in" for the new or proposed weapon system. (Usually the stand-in equipment is the predecessor to the new system.) Experts who work with the selected equipment are queried, using standardized questions, to identify problem tasks performed (i.e., high driver tasks). The standardized questions concern task learning difficulty, learning decay rate, task frequency, percentage of time performing task, and time to train task. Similar data is collected from other sources. The high driver tasks are identified for the purpose of assuring that similar problem tasks do not recur on the new system. The analysis can also have the secondary benefit of identifying ways to lessen these impacts on the existing system(s).

For further information, please contact:

U.S. Army TRADOC Analysis Center (TRAC) ATTN: ATRC-L (Dr. Gordon Goodwin) 401 First Street Ft Lee, VA 23801-1511 (804) 765-1822 DSN 221-1822

## JACK The Human Factor for Computer Aided Design

The Army Research Laboratory (ARL), the Army Research Office, The University of Pennsylvania's Computer Graphics Research Lab, and NASA have spent more than 10 years of effort and tech base dollars developing JACK for sophisticated human factors analysis applications at U.S. Army agencies, NASA, various defense contractors, and commercial companies. Integrating the human factor into computer-aided design for increased productivity & cost savings; JACK is a powerful, highly interactive Human Factors Design and Ergonomics Visualization software package that gives you the ability to test your computer-generated designs with realistic human figures. JACK allows you to: increase design flexibility by evaluating critical ergonomic design parameters while still in the computer environment; reduce costs by making design changes before building expensive prototypes; increase productivity by using effective, time-saving tools to simplify analysis of conceptual designs.

For more information, please contact:

Richard Kozycki Army Research Laboratory Human Research and Engineering Directorate (410) 278-5880

## Mathematical Ear Model (Airbag)

Modern weapons and a broad spectrum of industrial machinery produce intense acoustic impulses that can limit their use and restrict their design. Recent studies have indicated that all current noise exposure standards and design guidelines for impulse generating weapons are seriously in error. To overcome these limitations, ARL-HRED developed a mathematical model of the human auditory system that predicts the hazard from any free-field pressure and provides a visual display of the damage process as it is occurring. The model is a powerful design tool because it shows the specific parts of the waveform that need to be addressed in machinery and weapon design. This unique model is the only method of assessing noise hazard for the entire range of impulses that are relevant to the Army. The model has the potential both to serve as an international design standard for weapons and to provide damage/risk criteria for intense impulses of industrial origin.

For more information, please contact:

Army Research Laboratory Human Research and Engineering Directorate Dr. Dick Price 410-278-5976

## Windows Crew (WinCrew)

WinCrew is the ideal tool for studying systems when a central issue is whether the humans will be able to handle the workload. It allows the system analyst to predict and assess changes in system performance as a result of varying function allocation, number of operators or crew, level of automation, task design, mode of information presentation, and response to high workload. Through iterative use, the analyst can determine high drivers affecting human and system performance.

WinCrew is most useful before Milestone B, both for identifying feasible crew station designs and for evaluating prototypes and mock-ups of proposed crew station systems. Human Factors analysts and project managers involved in source selection evaluation boards, operational capability formulation, and proof-of-principle activities will find WinCrew valuable. A background in operations research analysis, basic task analysis methods, and workload concepts, are helpful for using the tool. However, a bachelor's degree in a Human Factors Engineering related field is usually sufficient.

Sponsor: ARL-HRED

POC: Mr. John Lockett,

(410) 278-5875, DSN 298-5875.

## Operator Workload Knowledge-Based Expert System Tool (OWLKNEST)

OWLKNEST is a microcomputer-based methodology that guides selection of the appropriate techniques for assessing operator workload in developing Army systems. The outputs of OWLKNEST serve as a guide to indicate the order in which the user should consider applying the techniques.

Sponsor: Army Research Institute (ARI)

POC: Dr. Richard E. Christ, (913) 684-4933

## HARDMAN Comparability Methodology (HCM)

The HCM provides a structured technique for estimating the manpower, personnel, and training resource requirements associated with a new system. As the name suggests, HCM utilizes comparability analysis techniques. The new system's manpower requirements are estimated using data on existing systems/subsystems/components that closely match the new system, in terms of functionality and supportability. Personnel requirements are developed by applying historical flow rates to the estimated manpower requirements for each MOS involved in maintaining, operating, and supporting the system. Existing training courses of instruction are modified to reflect the expected training requirements of the new system, and annual graduate and instructor requirements are also computed. The HCM analysis should be performed very

early in the acquisition process and should be updated as information on the new system as it becomes available. HARDMAN has historically been an expensive, time-intensive process requiring a mainframe computer. For those reasons, a complete HARDMAN application is impractical. However, the basic methodology is sound and portions steps may be used to meet specific needs.

For more information, please contact:

U.S. Army TRADOC Analysis Center (TRAC) ATTN: ATRC-L (Dr. Gordon Goodwin) 401 First Street Ft. Lee, VA 23801-1511 (804) 765-1822, DSN 539-1822

## Parameter Assessment List—MANPRINT Automated Tool Edition (PAL-MATE)

To support the assessment process of MANPRINT's newest domain, called Soldier Survivability, ARL-HRED and Survivability/Lethality Analysis Directorate (SLAD) have developed an assessment guideline, referred to as the PAL. The list consists of rating sheets which outline a series of issues under six broad categories. This methodology is a paper-and-pencil process. The completion of the rating sheets can be a time consuming and onerous process. An automated version was created to alleviate these problems. Additionally, because multiple agencies contribute to an assessment, an automated format will provide more conformity in domain report assessment and preparation. PAL-MATE is a PC-based automated version of the PAL. PAL-MATE, is a comprehensive accounting of what to rate, but not how to rate it. The tool's features include: (a) a user-friendly front-end interface; (b) a menu to easily select a given portion of the PAL to work on; (c) rating sheet screens; (d) navigation aids; (e) embedded user guide; (f) provision for easy changes to be made to the issues contained in the rating sheets (additions, deletions, edits); (g) roll-up of information from the issue level to the component-level summary sheets; (h) search function; (i) glossary; and (j) report generation.

IMPLEMENTATION: IBM compatible with at least 386 CPU, 4 megabytes RAM, hard disk drive with 15 megabytes of free space, Windows 3.1 (or higher).

#### Sponsors:

U.S. Army Research Laboratory—Human Research and Engineering Directorate. ATTN: AMSRL-HR-MB (Headley)
Aberdeen Proving Ground, MD 21005-5425

U.S. Army Research Laboratory—Survivability/Lethality Analysis Directorate ATTN: AMSRL-SL-BE (Zigler)
Aberdeen Proving Ground, MD 21005-5068

To obtain a copy, please contact:

Mr. Richard Zigler

410-278-8625, DSN Phone: 298-8625

E-mail: rzigler@arl.mil

There are a number of automated tools which are used along with testing and experimentation in the survivability work involved with personnel and/or systems in the areas of ballistics, atmospherics and obscurants, nuclear warfare, biological warfare, chemical warfare, and electronic warfare. For further information, contract ARL-SLAD and/or review the ARL-SLAD web site at <a href="http://www.arl.army.mil/slad/">http://www.arl.army.mil/slad/</a>

#### Manpower, Personnel Capabilities, and Training (MPT) Guide

The MPT Guide is keyed to the DoD 5000 Acquisition Model as the framework for questions that identify risks and issues. The DoD 5000 Acquisition Model consists of three Milestones (A, B and C) which are further divided into five phases consisting of Concept Refinement, Technology Development, System Development and Demonstration, Production and Deployment and Operations and Support. The MPT Guide provides a series of MPT questions linked to each phase. Each of the questions identifies MPT risks that should be analyzed for impact, determine a course of action and complete the decision, proceeding, following or during the current phase. The questions are supported by regulatory guidance and reference sources which can be accessed through the Internet. The MPT Guide may be down loaded by visiting the U.S. Army HRC, MPT Domain Web Site, and selecting the MPT Guide at: <a href="https://www.perscomonline.army.mil/DCSOPS/DCSOPS\_MANPOWER.htm">https://www.perscomonline.army.mil/DCSOPS/DCSOPS\_MANPOWER.htm</a>

For more information, please contact:

Mr. Wayne Cream Chief, MPT Domain Branch U.S. Army Human Resources Command 200 Stovall Street Alexandria, VA 22332-0400 (703) 325-2026 or DSN 221-2026 Wayne.Cream@hoffman.army.mil

## **APPENDIX G**

## MANPRINT DOMAIN RISK IDENTIFICATION FORM (example)

Date Risk Opened: Last Review Date:	
Date Resolved:	
1. <u>Risk #:</u> Provide a brief statement of the risk including the background.	
2. <b>MANPRINT Domain:</b> Insert the MANPRINT Domain(s) affected. It is possible that one risk may affect multiple MANPRINT Domains.	
3. <u>Impact of the Risk:</u> Provide a brief description of the risk impact including the background	d.
4. <b>Planned Solutions:</b> The plans or strategies for resolving the risk. Include any product deliverables that resolve the risk.	
5. <u>Current Status</u> : (e.g., awaiting funding, OIPT decision, MDR)	
6. <u>Other Approaches Not Yet Attempted to Resolve the Risk</u> : Results of brain storming sessions, ICTs or IPTs.	
7. <b>Responsible Agency</b> : (e.g., PM XXXX; TRADOC; ARL-HRED)	
POC: Phone: Email:	
8. <b>Resolution by Milestone/Phase</b> : The projected suspense date (e.g., Prior to Milestone C)	

## **APPENDIX H**

#### SAMPLE MANPRINT ASSESSMENT

DAPE-MR (602-2a)

MEMORANDUM THRU THE ARMY SYSTEMS ACQUISITION REVIEW (ASARC) EXECUTIVE SECRETARY

FOR THE ASARC MEMBERS

SUBJECT: MANPRINT Assessment (MA) for the XXXXX Program

#### 1. References:

- a. AR 602-2, Manpower and Personnel Integration (MANPRINT) in the System Acquisition Process, 1 Jun 01.
- b. Memorandum, HRC, AHRC-PLC-M, 10 Dec 04, subject: Manpower, Personnel Capabilities and Training (MPT) Domain Assessment for the XXXXX, 15 Feb XXXX (Enclosure 1).
- c. Human Factors Engineering Assessment for the XXXXX, 17 Feb XXXX (Enclosure 2).
- d. XXXX Safety Assessment/Safety and Health Data Sheet (S&HDS), 16 Feb XXXX (Enclosure 3).
- e. Memorandum, CHPPM, MCHB-TS-OHH, 29 Jan 05, subject: Updated Health Hazard Assessment Report on the XXXX, Project No. 69-MP-XXXX-05 (Enclosure 4).
- f. Soldier Survivability (SSv) Domain Report for the XXXX, 18 Nov XXXX (Enclosure 5).
- 2. Based on a review of the individual domain assessments (the Independent Safety Assessment is still in process), the overall MANPRINT rating of the XXXX is **AMBER**. There are no known critical issues that will prevent XXXX from transitioning to Full Rate Production. However, there are several major issues in the domains of Safety, Health Hazards, Soldier Survivability, and Human Factors Engineering that will require management and resolution by the material and combat developers during the next phase of development to ensure XXXX total system performance is acceptable. The oxygen depletion risk, identified in the Health Hazards and Safety Assessments, remains a concern. This assessment relies upon the accomplishment of Interim Solutions and GET/WELL TARGETS as stated in the Materiel Release Get/Well Status Report. The XXXX PM and staff are to be commended for their consistent MANPRINT process.

- 3. The individual MANPRINT Domain Assessments contain details of the issues. A brief discussion of these issues is outlined for each domain as appropriate. The author of this Assessment assigned domain color ratings for the Manpower, Personnel, and Training; Human Factors Engineering; and Safety domains based on domain assessment recommendations and issues. The Army Research Laboratory, Survivability and Lethality Analysis Directorate (SLAD) provided the color rating for the Soldier Survivability domain.
- a. <u>Manpower</u>, <u>Personnel and Training</u> Rating: **Green** (Enclosure1). The MPT Domain Assessment was prepared by the U. S. Army Human Resources Command (HRC). The HRC recommends that the program transition to Full Rate Production. The MPT Domain Assessment did not identify any critical, major, or minor issues with the XXXX.
- b. <u>Human Factors Engineering</u> Rating: **Amber** (Enclosure 2). The HFE Assessment was prepared by the Army Research Laboratory, Human Research and Engineering Directorate (HRED). The HRED recommends that the program transition to Full Rate Production. The HFEA identified two major and four minor issues with the XXXX.
  - (1) Critical Issue. None
  - (2) Major Issues.
- (a) The XXXX does not have air conditioning. The XXXX will be operated in basic, cold, and hot temperature environments (-25 $^{\circ}$  to 120 $^{\circ}$ F). Internal cab temperatures in excess of 120 $^{\circ}$ F can reasonably be expected in the cab at the upper extreme of the XXXX operating range. This was listed as a major concern in the 2003 XXXX HFEA.
- (b) Past testing of the family of medium and tactical vehicles indicated that heater performance is marginal for the lower extreme of the XXXX operating range. This was listed as a minor concern in the 2003 XXXX HFEA.
- c. <u>System Safety</u> Rating: **Amber** (Enclosure 3). The Independent Safety Assessment was prepared by the U.S. Army Combat Readiness Center. The CRC identified two high risk hazards in the areas of crash protection. System Safety Program Management deficiencies were noted to include absence of MIL-STD 882 guidance and lack of a functional System Safety Working Group
- d. <u>Health Hazard Assessment Report</u> Rating: **Amber** (Enclosure 4). The Health Hazard Assessment Report (HHAR) was €prepared by the U.S. Army Center for Health Promotion and Preventive Medicine (CHPPM). The CHPPM recommends that the program transition to Full Rate Production. The HHAR identified four high risk health hazards for the XXXX. These high risk health hazards can be adequately controlled if the HHAR recommendations are adopted for use and implemented by the user. The high risk health hazards are:
- (1) Oxygen Deficiency. A Risk Assessment Code (RAC) of 2 (Hazard Severity (HS) I, Hazard Probability [HP] D) is assigned for failure to comply with recommendations. This is a

high risk level health hazard IAW the Risk Decision Authority Matrix contained in AR 40-10, paragraph B-4 or a <u>critical MANPRINT</u> issue IAW AR 602-2, Section II.

- (2) Steady-state Noise. A RAC of 2 (HS II, HP C) is assigned for failure to comply with the recommendations. This is a high risk level health hazard IAW the Risk Decision Authority Matrix contained in AR 40-10, paragraph B-4 or a <u>major MANPRINT</u> issue IAW AR 602-2, Section II.
- (3) Impulse Noise. A RAC of 2 (HS II, HP C) is assigned for failure to comply with recommendations. This is a high risk level health hazard IAW the Risk Decision Authority Matrix contained in AR 40-10, paragraph B-4 or a <u>major MANPRINT</u> issue IAW AR 602-2, Section II.
- (4) Heat Stress. A RAC of 2 (HS II, HP C) is assigned for failure to comply with recommendations. This is a high risk level health hazard IAW the Risk Decision Authority Matrix contained in AR 40-10, paragraph B-4 or a <u>major MANPRINT</u> issue IAW AR 602-2, Section II.
- e. <u>Soldier Survivability</u> Rating: **Amber** (Enclosure 5). The SSv Domain Report was prepared by the Army Research Laboratory, Survivability and Lethality Analysis Directorate (SLAD). The SLAD recommends that the program transition to Full Rate Production. The SSv Domain Report identified four major and four minor issues with the XXXX.
  - (1) Critical Issue. None.
  - (2) Major Issues.
- (a) Prevent Damage if Attacked. Damage from ballistics (i.e., artillery, small arms, and shoulder-fired munitions, etc.) to the XXXX is the predominant threat concern in the SSv Domain Report. Insufficient data is available to show the extent of damage that could occur after an attack.
- (b) Minimize Medical Injury if Damaged. The XXXX may be subject to attack from a variety of ballistic threats to include artillery, small arms, shoulder-fired munitions, and chemical-biological and radiological weapons. Insufficient data is available to confirm XXXX can be decontaminated to negligible risk levels.
- (c) Reduce Mental and Physical Fatigue. The XXXX does not have air conditioning. This issue is addressed in the Health Hazard Assessment Report and the Human Factors Engineering Assessment. A second major concern is operations in MOPP IV without air conditioning in the XXXX.
- 4. This MANPRINT Assessment was prepared by the Army Research Laboratory, Human Research and Engineering Directorate (ARL HRED). Questions regarding this assessment should be directed to Mr. XXX, HQDA, G-1, MANPRINT Directorate, DSN 225-xxxx or

commercial (703) 695-XXXX or Mr. XXX, ARL HRED AMCOM Missile Field Element, DSN 746-XXXX or commercial (256) 876-XXXX.

#### FOR THE DEPUTY CHIEF OF STAFF, G-1:

#### 5 Encls

## MICHAEL DRILLINGS Director for MANPRINT

CF: (w/encls)

Commander, U.S. Army Center for Health Promotion and Preventive Medicine, ATTN: MCHB-MO-A (Mr. Gross), 5158 Blackhawk Road, Aberdeen Proving Ground, MD 21010-6175

Commander, U.S. Army Human Resources Command, ATTN: AHRC-PLC-M (Mr. Cream), 200 Stovall Street, Alexandria, VA 22332-0406

Commander, U.S. Army Training and Doctrine Command, ATTN: ATCD-RP (Mr. Dwyer), Fort Monroe, VA 23651-5000

Commander, U.S. Army Safety Center, ATTN: CSSC-ISE, Fort Rucker, AL 36362

Commander, USATEC, ATTN: CSTE-OM, Park Center IV, 4501 Ford Avenue, Alexandria, VA 22302

Commander, USAOTC, ATTN: CSTE-OTC-TD (Mr. Pasini), 91012 Station Avenue, Fort Hood, TX 76544

Commander, U.S. Army Materiel Command, ATTN: AMCSG-H (LTC Leggieri), 5001 Eisenhower Avenue, Alexandria, VA 22333-0001

Director, Army Safety Office, ATTN: DACS-SF (Mr. Patton), 200 Army Pentagon, Washington, DC 20310-0200

Army Research Laboratory, Survivability and Lethality Analysis Directorate, ATTN: AMSRD-ARL-SL-I (Mr. Zigler), Aberdeen Proving Ground, MD 21005-5068

Army Research Laboratory, ATTN: AMSRD-ARL-HR-MB

(Mr. Paragallo), Bldg 459, Aberdeen Proving Ground, MD 21005-5425

Army Research Laboratory, AMSRL-HR-MD (Mr. Cook) Bldg 4500

Room C-242, Redstone Arsenal, AL 35898-7290

#### **CF: (Continued)**

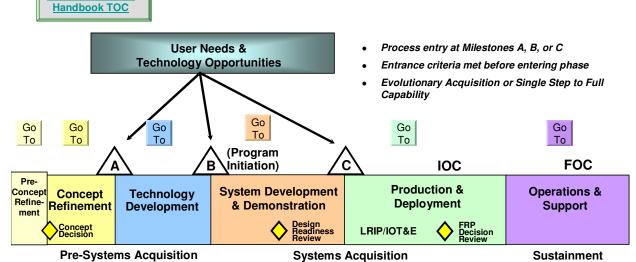
#### Program Manager, XXXX Project Office,

ATTN: SFAE-XXX-XX (COL XXX), Redstone Arsenal, AL 35898

## **APPENDIX I**

#### **DoD ACQUISITION MODEL**

# The Acquisition Model



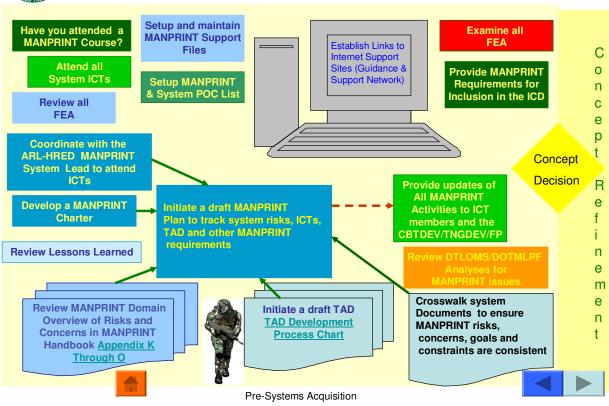
See DoDI 5000.2, E9. Enclosure 9, paragraph E9.1. "A PM shall be designated for each acquisition program. This designation shall be made no later than program initiation." (Program Initiation is Normally considered at MS B).

**Go To MANPRINT** 

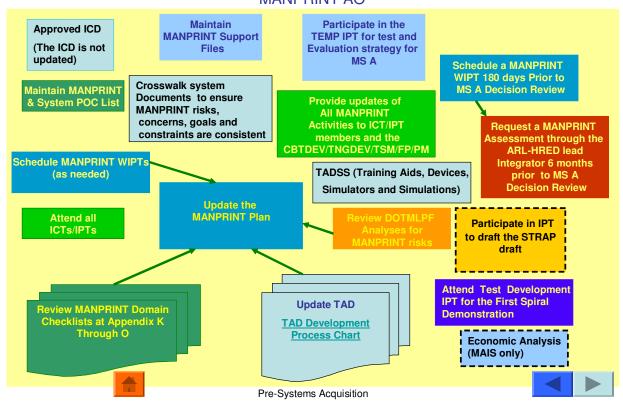
Initial Operating Capability (IOC)
Initial Operational Test and Evaluation (IOT&E)
Full Operating Capability (FOC)
Low Rate Initial Production (LRIP)
Full Rate Production Decision Review (FRPDR)

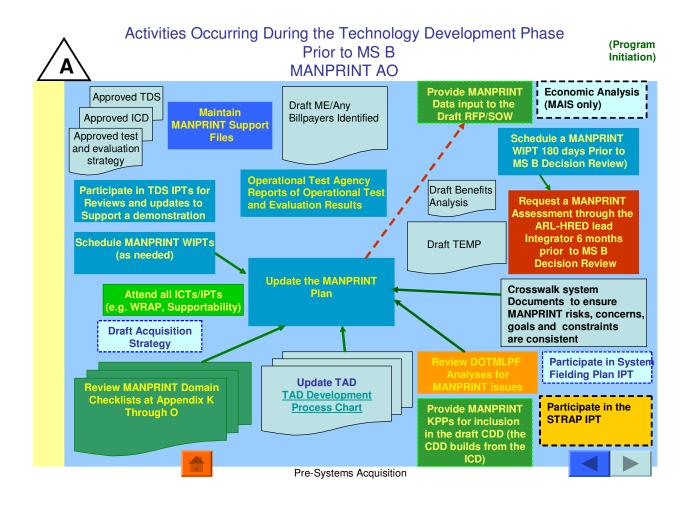


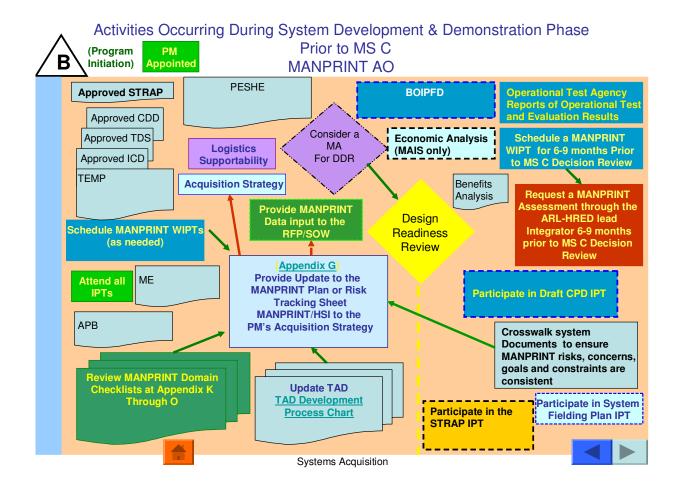
# Activities Occurring Prior to the Concept Decision Point of the Concept Refinement Phase MANPRINT AO

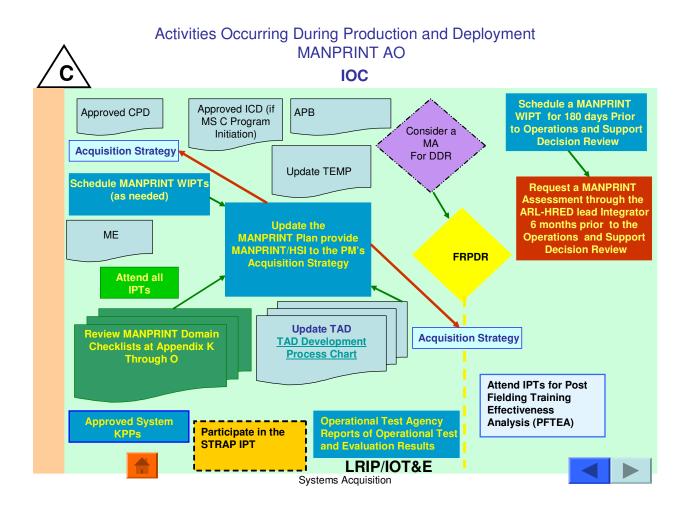


# Activities Occurring During the Concept Refinement Phase Prior to MS A MANPRINT AO





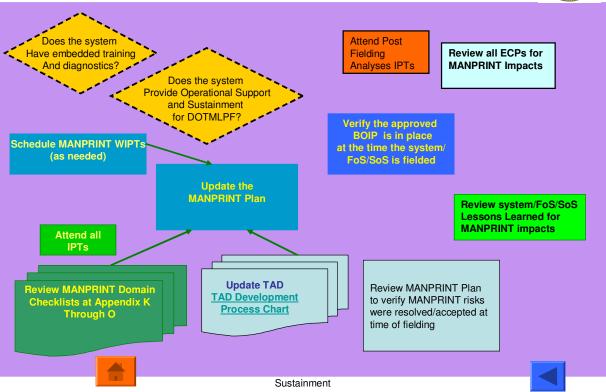




# Activities Occurring During Operations and Support MANPRINT AO



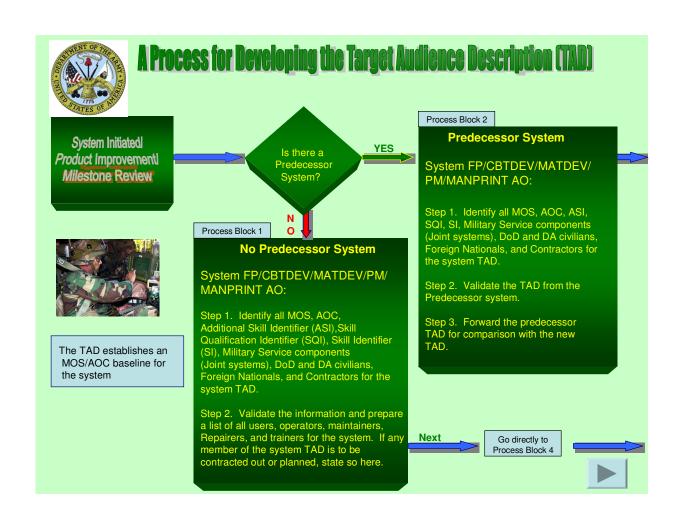
## **FOC**



# APPENDIX J

# THE TARGET AUDIENCE DESCRIPTION (TAD)

- 1. The TAD is one of the most important documents that should be developed for any new system or product improvement. It needs to be monitored and revalidated on a recurring basis. You will also find reference to the TOS in <u>DODI 5000.2</u>, Human Systems Integration (HSI), Enclosure 7, paragraph E7.3 Personnel. The TOS is used by other military services and is synonymous with the Army's TAD.
- 2. The TAD provides information about the personnel that will use, operate, maintain, train and repair a system. Ideally, the TAD provides a description of the quantity and qualifications of the soldiers, members of other service components (Navy, Air Force and Marines), DoD and DA Civilians, Foreign Nationals and/or contractors who will operate, train and maintain the system. If it is a joint service system, members of the other branches of service may also be identified and included as a part of the TAD. This is important because the Army may be responsible for providing training to the members of other service components. This impacts facilities, training seats, the number of instructors or use of New Equipment Training (NET) teams.
- 3. The TAD is one of the first items that should be completed when initiating the development of or improvement to a system and is usually prepared early to support the Concept Refinement Phase. It is important for the MATDEV, CBTDEV, TNGDEV, TSM, Contractor, FP, PM, and MANPRINT AO to coordinate with each other to ensure an accurate TAD is prepared. Minimally, it should be updated prior to each MDR (Concept Decision, MS A, B, C and the FRPDR). See DoD Acquisition Model at: Appendix I DoD Acquisition Model. Also see the TAD Development Process Chart at TAD Development Process Chart to Appendix J.
- 4. An important thing to remember when developing the TAD is that there can be multiple MOS proponents involved with the system that is under development. You must be aware of the impacts to all MOS proponents that are in the TAD. You must work with each of these proponents to make them aware of any changes that impact their MOS. You may locate MOS Proponents by double clicking this internet link: <a href="TRADOC Schools">TRADOC Schools</a>. To make sure that you have accurate Area of Concentration (AOC) for Officers and MOS for Warrant Officers and Enlisted Personnel go to: <a href="https://perscomnd04.army.mil/MOSMARTBK.nsf/">https://perscomnd04.army.mil/MOSMARTBK.nsf/</a>. This is a secure web address. To access, highlight the address above, copy it, and paste it to the web browser and select "Go" or hit "Enter." Usually, this is the most up-to-date MOS information site available.
- 5. A detailed discussion of the TAD can be found in the MPT Guide at: <a href="https://www.perscomonline.army.mil/DCSOPS/DCSOPS\_MANPOWER.htm">https://www.perscomonline.army.mil/DCSOPS/DCSOPS\_MANPOWER.htm</a>
  This is a secure web address. To access, highlight the address above, copy it, and paste it to the web browser and select "Go" or hit "Enter." Usually, this is the most up-to-date MPT information site available.



# **APPENDIX K**

# MANPOWER, PERSONNEL CAPABILITIES, AND TRAINING (MPT) OVERVIEW OF RISKS

Step 1. The MPT Question Checklist by Acquisition Phase is contained in the MPT Guide. To download and view the MPT Guide, visit the web site below:

# https://www.perscomonline.army.mil/DCSOPS/DCSOPS\_MANPOWER.htm

- Step 2. This is a secure web site. To access highlight the address above, copy it and paste it to the web browser and select "Go" or hit "Enter."
- Step 3. Select the blue highlighted text <u>MPT Guide</u>. This will open a file download menu option.
- Step 4. Select "Save" from the menu.
- Step 5. Download the MPT Guide to your computer.
- Step 6. Double click the MPT Guide Icon on your screen.
- Step 7. This will allow you to access the MPT Guide at any time you need to refer to it. It has MPT risks by acquisition phase.

# APPENDIX L

#### **HUMAN FACTORS ENGINEERING (HFE) OVERVIEW OF RISKS**

- 1. HFE is the integration of human capabilities, human limitations, and other relevant human characteristics into system definition, design, development, and evaluation to optimize human-machine performance under operational conditions. To ensure operational readiness, efficiency, reliability, and maintainability, a comprehensive technical effort must be made to integrate human factors qualitative and quantitative information into system design, testing, and acquisition. Such information includes:
  - human characteristics
  - operator/maintainer capability requirements
  - soldier performance data
  - system interface requirements
  - biomedical factors
    - Does the user experience nausea or dizziness while operating or being transported by the system?
    - Is the system ergonomically designed to ensure ease of operation by the user?
  - safety factors
  - training factors
  - manning implication
- 2. The goals of HFE are:
  - Make equipment easier to operate, maintain, and support
  - Reduce the time to accomplish a task
  - Reduce the chance for operator error and accident
  - Reduce the amount of operator training
  - Reduce need for selection of operators with special background or capabilities
- •Note 1: Make sure HFE topics are addressed in the:
  - ICD
  - CDD
  - Contract SOW
  - CPD
  - T&E plans
- \*Note 2: The soldier cannot always adapt to design inadequacies. HFE SMEs should actively participate in the concept development, system design, and test planning. Feedback from user or user's representative may be solicited to make final adjustments.
- **Note 3**: Equipment performance requirements cannot be considered independent of human performance requirements and capabilities. The total system design includes hardware/software

and leaders/users, operators, maintainers, and support personnel.

- 3. Obtain essential information for Organization Design (see Key Document 1):
  - Mission statements for organization in which the weapon system/equipment is used
  - Mission statements for parent organization and subordinate organizations
  - Lists of Battlefield Functions (Key Documents 2 and 3) that must be performed to execute the missions
  - Required Capabilities
  - Organizational wiring diagrams (chains of command)
  - Job and job task descriptions
- 4. Develop Preliminary Analysis (or Check) of Total System Functions for Achieving Required Capabilities (see Key Document 4) by checking for:
  - Consistency of missions, and Battlefield Functions
  - Completeness of Total System functions specifications and Battlefield Functions
  - Consistency of responsibilities and authorities
  - Appropriateness of span of control
  - Adequacy of lines of communication (internal or external)
  - Issues in formation and maintenance of trust/cohesion within the organization (see Key Document 5)
  - Adequacy of provision for supplies (internal and external support).
- 5. Allocate Total System Functions to Man or Machine (see Key Document 4):
  - Human operators
  - Equipment
  - Human Maintainers
  - Embedded fault detection and diagnostics
- 6. Obtain data for Job-task performance from:
  - SME observations and ratings
  - Direct performance measures
  - Video (time & motion studies)
  - Target Audience Focus Groups
  - Checklists
  - Questionnaires
  - Interviews
- 7. Number of tasks attempted and completed
- 8. Time to perform

# 9. Accuracy

- Number or proportion of successfully completed tasks.
- Human reliability: Consider sources of human error:
  - Aptitude: Does the task exceed the limitations of the target audience capabilities? (e.g., too many steps or too difficult)
  - Task Overload (mental fatigue)
  - Inadequate training
  - Equipment configuration induces error
  - Environmental conditions induce human error
  - Eliminate through design typical sources of human error

# 10. Reasons tasks were not completed

- Insufficient manpower
- Inadequate aptitudes
- Poor training
- Poor human factors design
- Lack of, or poor job performance aids (e.g. embedded training, system operating manuals, out-of-date simulators)
- Lack of feedback devices

# 11. Task description & analysis

- Task criticality, frequency of task, learning difficulty, decay rate
- "High driver" tasks
- Information flow analysis
- Task allocation analysis
  - Soldier
  - Soldier and machine
  - Machine
  - Manual override of specific functions considered
  - Sequence of operational instructions
  - Task-interdependence of crew members

## Workload analysis

- Mental workload:
  - o Information processing demands
  - o Memory requirements
  - o Learning and retention requirements
  - Sensory discrimination requirements

- Physical workload demands:
  - o Task overload
  - o Biomedical considerations (e.g. operational stress)
  - o Strength and endurance considerations
- How will degraded manning affect performance?
- Is the number of soldiers planned to perform various critical tasks required by the system sufficient to meet the system performance requirements?
- Psychomotor requirements
- Task environment
- Maintenance, ease of: does system require major dismantling for access to frequently replaced components? Are built-in self-diagnostics feasible?

# 12. Equipment Design

- Crew interfaces
- Human-computer interface
- Interface compatibility with the capabilities/characteristics of the target audience
- Usability (as judged by the test players via questionnaires, or exhibited in behaviors). Poor interface design or poor training could be reflected by:
  - Repetition of task steps
  - Increase in error rates
  - Excessive use of on-line help or system documentation
  - Requests for assistance
  - Verbal/non-verbal complaints.

# 13. Workspace Design:

- Ergonomic considerations
- Anthropometric data
- Stress
- Heat stress
- Psychological stress
- Continuous operations
- Fatigue
- Isolation
- Crowding
- Will battle stress degrade performance?

**NBC conditions**: Can the operator perform all required tasks in the prescribed manner while wearing mission-oriented protective posture (MOPP) or other special equipment?

# **Key Documents**

- TRADOC REG 71-17, Organizational Design, Unit Reference Sheets (URS), and Automated Unit Reference Sheets (AURS), (see Chapter 3)
- TRADOC PAM 11-9, Blueprint of the Battlefield, 27 Apr 90 (paper format no Link available)
- MANPRINT: An Approach to Systems Integration, H.R. Booher (Ed.), Van Nostrand Reinhold, N.Y., 1990. See Chapter 6, Conceptual System Design and the Human Role (H.E. Price), subsection on Allocation of Functions (pp. 187-193)
- A Comparative Analysis of Organizations, 2nd Ed., Free Press, New York, 1975
- AR 602-1 Human Factors Engineering Program
- NASA Task Load Index
- HFE Web Site

# **APPENDIX M**

#### SYSTEM SAFETY (SS) DOMAIN OVERVIEW OF RISKS

1. The design features and operating characteristics of a system that serves to minimize the potential for human or machine errors or failure that causes injurious accidents. System Safety deals with both the safety of the materiel system, as well as the operators, maintainers and support personnel.

**Objective**: Maximize operational readiness and mission effectiveness through accident prevention by ensuring that appropriate hazard control measures are designed into the total system (materiel, performance procedures, and training) in a timely manner.

**Note**: A large Lessons Learned accident database is located at U.S. Army Combat Readiness Center.

- 2. Has a safety risk assessment been completed?
- 3. Have safety risks concerning power sources been considered?
  - Electrical
  - Mechanical
  - Hydraulics/Pneumatics
  - Chemical/explosive/propellants.
- 4. Look for safety risks associated with:
  - Exposed, moving equipment
  - Radio Frequency (RF)/Microwave (MW) antenna
  - Hazardous materials or by-products
  - Combustion processes
  - High temperature devices
  - Vehicular movement/flight
  - Gun systems
  - Missile systems.
- 5. Ensure design requirement statements have been developed to address/prevent the impact of:
  - Catastrophic loss of materiel system or soldier due to failure/malfunction of component or procedural error/omission.
  - Operational loss of system or disabling soldier injury due to failure/malfunction of component or procedural error/omission.
  - Loss of system effectiveness or soldier injury due to failure malfunction of component or procedural error/omission.

- 6. Are all trade-offs or impact issues looked at for their effects on all other MANPRINT domains as well as system cost and performance requirements (e.g., excessive training and personnel capability requirements to compensate for materiel system design weaknesses?
- 7. Are all functional, cost and performance data, as well as assumptions and other criteria, consistent with other analyses being performed on the system?
- 8. Is the system safe for the soldier/civilian to operate, maintain, repair, and support?

# **Key Documents**

- AR 385-10 Army Safety Program
- AR 385-16 Systems Safety Engineering and Management
- MIL-STD-882D, 10 February 2000 Systems Safety Program Requirements

# APPENDIX N

#### **HEALTH HAZARDS (HH) DOMAIN OVERVIEW OF RISKS**

- 1. The design features and operating characteristics of a system that create significant risks of bodily injury or death; prominent sources of health hazards include: acoustic energy, chemical substances, biological substances, temperature extremes, radiation energy, oxygen deficiency, shock (not electrical), trauma, and vibration.
- 2. Areas of consideration (information taken from first reference listed at end of this domain section; please refer to it for complete details):
  - a. Acoustic energy: Consider probability of system-induced hearing loss:
    - Steady-State Noise: Magnitude, frequency, duration, type
    - Impulse Noise: Auditory and nonauditory blast overpressure.
  - b. Biological substances:
    - Diseases transmitted to human by various animal species
    - Communicable diseases
    - Exposure to toxic plants
    - Exposure to stinging and biting insects and anthropods
    - Exposure to species of poisonous lizards and snakes
    - Exposure to blood-borne pathogens
    - Diseases and debilitating ailments resulting from substandard levels of personal hygiene and sanitation
    - Potential hazards associated with operation of food service facilities and management of field rations, microbiological quality of water supply, solid and liquid waste disposal, management of sewage disposal, infectious and medical wastes, pest management, graves registration, and field sanitation and personal hygiene practices and devices.
  - c. Chemical substances (combustion products & other toxic substances.):
    - Solid or liquid exposures from various physical states via contact, inhalation, and/or ingestion.
  - d. Oxygen deficiency:
    - From poor ventilation in vehicle cabs or confined (enclosed) spaces.
    - Hypoxia at high altitudes.

- e. Radiation energy:
  - Non-ionizing radiation
  - Ionizing radiation.

#### f. Shock:

- Shock (not electrical) (e.g., opening forces of a parachute or weapon recoil).
- Whole-body vibration (e.g., from military ground vehicles operating over secondary and cross-country routes)
- Segmental vibration (e.g., localized body area or limb in direct contact with a vibrating source, operating a hand-held tool).
- g. Temperature extremes & humidity
- h. Trauma:
  - Physical trauma (e.g., resulting from impact)
  - Musculoskeletal trauma (e.g., resulting from heavy lifting or other adverse ergonomic health impact).
- 3. Is a HHA planned?
- 4. Have design requirement statements been developed to address/prevent the impact or consequences of exposure to health hazards during operation, maintenance, or repair from:
  - The system itself?
  - Associated equipment?
- 5. Is qualified ICT/IPT support available from Preventive Medicine Service personnel from supporting Medical activity collocated with TRADOC activity?
- 6. Key Documents
  - AR 40-10, Health Hazard Assessment Program in Support of the Army Materiel Acquisition Decision Process. To view/download go to:

http://www.usapa.army.mil/pdffiles/r40 10.pdf

• U.S. Army Health Hazard Assessment Manual, U.S. Army Center for Health Promotion and Preventive Medicine, ATTN: MCHB-TS-OHH, 5158 Blackhawk Road, APG, MD 21010-5422. To view/download go to:

http://chppm-www.apgea.army.mil/hha/Docs/amc-hha-guide.htm

• Department of Defense Instruction No. 6055.1, DoD Safety and Occupational Health (SOH) Program. To view/download go to

http://www.dtic.mil/whs/directives/corres/pdf2/i60551p.pdf

• Department of Defense Instruction <u>DoDI 5000.2</u>, "Operation of the Defense Acquisition System," for Mandatory Procedures for MDAPS and MAIS Acquisition Programs.

# **APPENDIX O**

# SOLDIER SURVIVABILITY (SSv) DOMAIN OVERVIEW OF RISKS

- 1. The characteristics of a system that can reduce fratricide, detectability and probability of being attacked, as well as minimize system damage, soldier injury, and cognitive and physical fatigue.
- 2. The PAL contains approximately 170 issues. There is a large amount of work effort required to answer all the issues that are addressed in the PAL. Assessment Components (the information below is from the first reference cited in the document section; it contains detailed listings of issues to rate):

#### a. Reduction of Fratricide:

- Consider the system's ability to prevent engagement by allied systems in a fratricidal incident.
- Assess the system's ability to support correct identification of U.S. or allied systems, which might otherwise be engaged in a fratricidal incident.
- Consider the system's support of crew training and readiness to reduce the probability of a fratricidal event.
- Assess the system's weapons design characteristics which reduce the probability of committing fratricide.

## b. Reduction of Detectability of the Soldier:

- Consider the system's physical signature as it affects the system's detectability by threat forces.
- Assess the system's operational characteristics as they affect the system's detectability by threat forces.

#### c. Reduction of the Probability of being Attacked:

- Assess the system's ability to avoid appearing as a high value target.
- Assess the system's ability to actively prevent or deter attack.

## d. Minimization of Damage Incurred:

- Assess the effect of the system's concept of employment on the system's survivability.
- Consider the system's ability to minimize the risk to supporting personnel if this system is attacked.

#### e. Minimization of Injury incurred:

- Consider the system's ability to protect the crew from attacking weapons.
- Consider the system's potential sources of injury to the crew, or the supported troops, as they are affected by the fielding of this system.
- Assess the system's ability to protect the crew from hazards relating to on-board equipment (fuel, munitions, etc.) in the event of an attack.
- Assess the system's ability to prevent further injury to the soldier after being attacked.
- Assess the system's ability to support treatment and evacuation of injured soldiers.

# f. Reduction of Physical and Mental Fatigue:

- Consider the physical constraints and workload placed on the soldier by the system.
- Consider the cognitive constraints and workload placed on the soldier.
- Assess the system's ability to minimize the effect of environmental stressors on the soldier.
- Assess the system's ability to minimize the effect of physical and environmental stressors (e.g. noise, vibrations, bouncing, and extreme heat or cold) on the soldier.
- Assess the system's ability to promote unit/team cohesion.

#### 3. Key Documents and Tools

- PAL &
- PAL-MATE.

**Note**: The guides were developed by ARL-HRED and ARL-SLAD. Contact Director, U.S. Army Research Laboratory, ATTN: AMSRL-SL-BE (Mr. Richard Zigler), Aberdeen Proving Ground, MD 21005-5068; phone 410-278-8625 (DSN 298) or go to:

# **ARL-SLAD**

• AR 70-75 Survivability of Army Personnel and Materiel.